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LISTS OF SPECIES

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Ichthyofaunal diversity of Chilika Lake, Odisha, India: an inventory, assessment of biodiversity status and comprehensive systematic checklist (1916–2014)

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Abstract: Chilika Lake, an assemblage of marine, brackish and freshwater ecosystems, on the east coast of India is a designated Ramsar site and a biodiversity hotspot. Intensive ichthyofaunal inventories and biodiversity assessments were carried out during 2000–2014 and documented 317 species belonging to 207 genera, in 88 families and 23 orders, including two endemic (Gobiidae) and one exotic cichlid species (*Oreochromis mossambicus*). In total, 255 collections (178 collections of previously recorded species and 77 that represent newly recorded species) were made during a post-restoration survey accounting for 80.44% retrieval of historically documented species. This paper presents an updated and comprehensive checklist of the lake's ichthyofauna (1916–2014), which is comprised of 278 food fishes, 271 (85.49%) migratory and 46 (14.51%) are resident species indicating that the lake fishery is largely migratory species-dependent. An account of faunal characteristics for 129 commercially important species is provided. The checklist also documents 48 threatened species and 103 species under different categories of conservation status.

Key words: ichthyofauna, Chilika Lake, biodiversity, checklist, species inventory

INTRODUCTION

Chilika Lake (Figure 1) is the largest coastal wetland ecosystem on the Indian subcontinent (Mohapatra et al. 2007) and the largest brackish water lake in Asia (Mangla 1989; Dujovny 2009). It is one of the region's finest repositories of aquatic biodiversity and a fisheries resource supporting the livelihoods and nutritional security of more than 200,000 local fishers. The unique and fragile ecosystem of Chilika Lake gradually began to lose its ecological integrity due to coastal processes, significant decrease in salinity regime, and degraded drainage basin with associated anthropogenic impacts (Mohanty et al. 2009). Between 1950 and 2000, the lake fishery was in a continuing state of decline when the fisheries output reached its lowest point by the end of the 1990s. The lake fishery suffered serious setbacks since the later part of the 1980s with the salinity level sharply decreasing to 9.6 PSU, compared to a level of more than 22.0 PSU in the 1960s (Banerjee and Roychoudhury 1966; Siddiqi and RamaRao 1995; Mohanty et al. 2009). The recruitment corridors (outer channel and Palur canal) also gradually silted up, adversely affecting the recruitment of fish and shellfish seed from the sea into the lake, while silted up river mouths (Mahanadi tributaries draining into the lake) in the northern sector of the lake also affected freshwater seed recruitment from riverine sources. In the aftermath of the gradual closure of the old lake mouth and Palur canal, the lake began transformation towards a freshwater ecosystem, causing substantial changes in the ichthyofaunal composition. Continued degradation of the ecosystem, changes in ecological characteristics, overall loss of biodiversity and decline in productivity adversely affected the livelihoods of local communities. In 1993, Chilika Lake was included on the Montreux Record of the Ramsar convention for its deteriorated state of health.

It became imperative to take action for the restoration of the fragile ecosystem of the Chilika Lake and *interalia* enhance its fisheries and bioresources for the greater benefit of the communities depending on them. Chilika

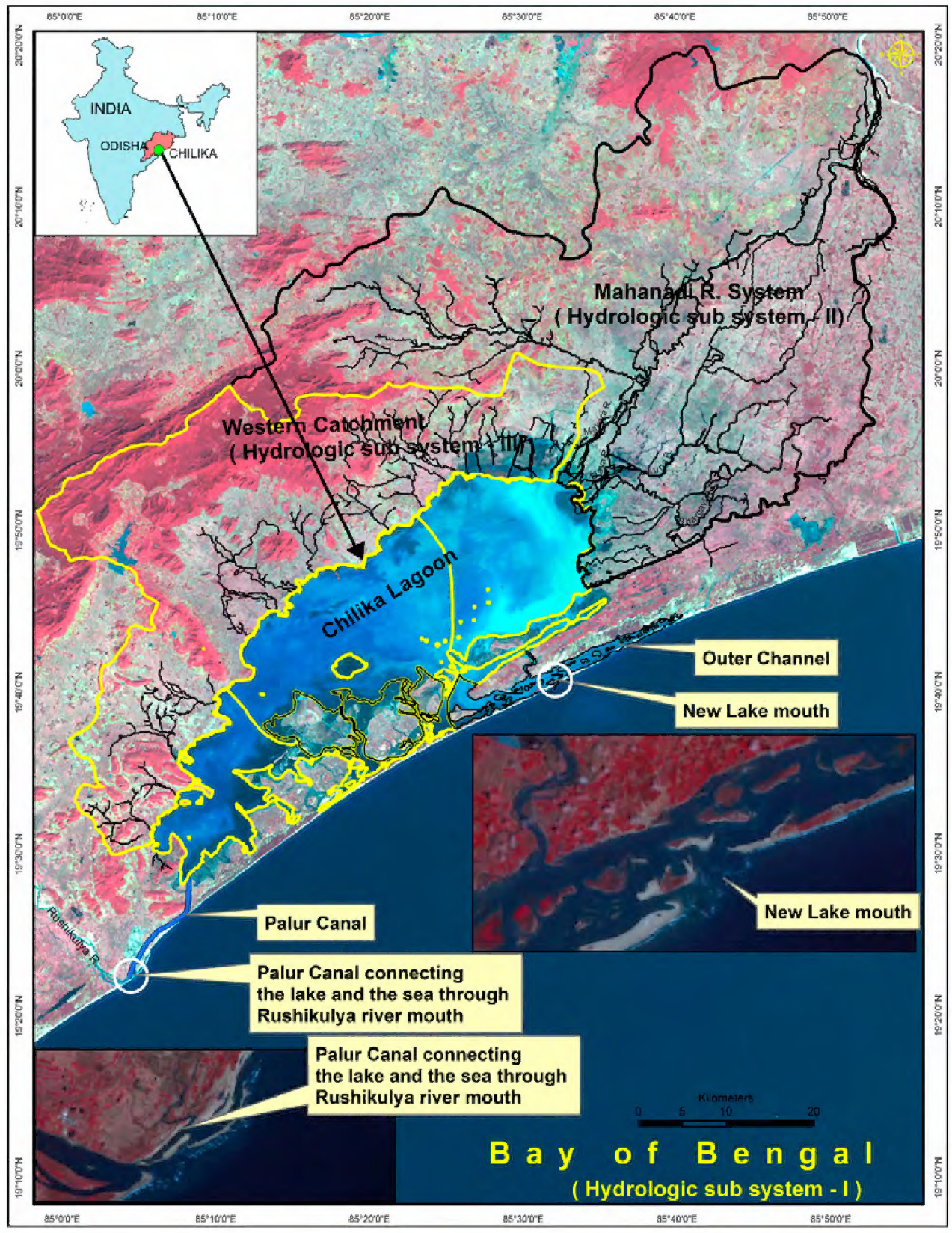


Figure 1. Location map of Chilika Lake and its connection with river systems and the Bay of Bengal.

Development Authority (CDA), based on the outcome of a rigorous numerical model study (Mohapatra et al. 2007), carried out a hydrological intervention by opening a new lake mouth during September 2000 along with the treatment of catchment and other restoration measures (Ghosh et al. 2006). Opening of the new lake mouth rapidly had a positive effect with spectacular enhancement in fisheries, overall ecology, and biodiversity. The annual fish catch from the lake increased sevenfold as compared to the catch in the pre-restoration period. After an assessment of the improvement of the lake ecosystem including biodiversity, the Ramsar Bureau removed the lake from the Montreux Record in 2002.

The pristineness of the lake and its fisheries had sharply declined during the eco-degradation phase but was successfully restored with enhancement in fish catch and fish diversity during the post-restoration period, i.e., after 2000 (Mohanty et al. 2007). During 1985–1987 (eco-degradation phase), the Zoological Survey of India (ZSI) conducted the Chilika Lake expeditions (1985–1987) and collected only 70 species (with four newly recorded species) which clearly documented the apparent loss of diversity and poor status of the lakes's ichthyofauna. Species diversity and genetic variability are necessary for long-term maintenance of stable complex ecosystems and species inventories are a relatively efficient and inexpensive tool for the monitoring of biodiversity, especially in areas that have suffered high rates of deforestation (Raiol et al. 2012) and ecosystem degradation (Mohanty et al. 2007). With the evolution of Chilika Lake about 3,500–4,000 years ago (UNESCO 2014), a large number of both marine and riverine species took the opportunity to use this lake's habitat. The uniqueness of Chilika Lake is characterized by a fish fauna that constitutes a mix of species belonging to fresh, marine and brackish water habitats. Identification, listing and prioritization of species are one of the important tasks for conservation of biodiversity (Molur and Walker 1998). Conservation and sustainable management of ichthyofaunal biodiversity in an aquatic ecosystem assume a greater importance in India as fishery resources have historically been, and continue to

remain, a base for livelihood and access to high quality animal protein. The overall fish biodiversity status in Indian wetlands has increasingly been threatened by natural ecophysiographical changes and anthropogenic pressures. Ichthyofaunal checklists of such wetlands and periodical inventories of species are therefore powerful tools and prerequisites for assessment of changes in biodiversity, following changes in ecological integrity and alteration of ecosystem functioning.

Thourough review of widely scattered literature revealed that 217 fish species (Chaudhuri 1916a, 1916b, 1916c; 1917; 1923; Hora 1923; Koumans 1941; Jones and Sujansinghani 1954; Devasundaram 1954; Roy and Sahoo 1957; Menon 1961; Misra 1962; Rajan et al. 1968; Misra 1969; 1976a; 1976b; Talwar and Kacker 1984; Talwar and Jhingran 1991; Rama Rao 1995) were reported from Chilika Lake (Rama Rao 1995) since the beginning of ichthyofaunal surveys in 1916. However, previous authors inadvertently missed recording some species, including eight species reported by Mohanty (1973). Furthermore, eight additional species collected during 1998–2000 (Bhatta et al. 2001) were newly recorded as part of the fauna of Chilika Lake before the hydrological intervention. Some of the species reported earlier are now considered synonyms or invalid. Thus during the pre-restoration period (until 2000) a total of 233 species had been reported as present in the lake. As reported by Mohanty et al. (2007), during 2000–2003 (post-restoration phase) a total of 43 species were recorded for the first time, bringing the total to 276 species.

The present work provides an intensive inventory of the ichthyofauna of Chilika Lake in the post-restoration phase (2000–2014) to assess the presence of earlier recorded species and report new records. It also compiles a comprehensive systematic checklist with updates on the taxonomy of fishes of Chilika Lake. This will serve as a baseline of the ichthyofaunal diversity of the lake and will facilitate future ichthyofaunal surveys, monitoring and fish biodiversity studies.

MATERIALS AND METHODS

Study site

The study area comprises the entire Chilika Lake, which is located along the east coast of India in the state of Odisha between latitudes 19°20′13.06″ N and 19°54′47.02″ N and longitudes 085°06′49.15″ E and 085°35′32.87″ E (Figure 1). The innundation area of the lake varies between 1,165 km² during monsoon to a minimum of 906 km² during the dry summer season. The lake's length is 64.3 km and its mean width 20.1 km (Ghosh and Pattnaik 2005). The lake is separated from the Bay of Bengal by a sandbar of 100–1,500 m width; an outer channel 32 km long connects the main lake with the Bay of Bengal. The total Chilika drainage basin including the lake itself and the contributing Islands and coastal strip (Figure 2) is 4,300 km² (World Bank 2005). Hydrologically Chilika is influenced by three subsystems: the Mahanadi River tributaries, some 52 rivers and streams draining into the lake from the western catchment, and the Bay of Bengal (World Bank 2005). Ecologically the lake is an assemblage of very to relatively shallow (0.38–6.2 m) marine, brackish and freshwater environs. It is primarily the dynamic salinity regime that enables the lake to support high biodiversity and a productive fishery. The salinity dynamics are controlled jointly by the nature of the connection to the sea, associated tidal fluctuations, and the volume and timing of freshwater inflows to the lake (World Bank 2005). The lake is broadly divided into four ecological sectors namely Northern, Central, Southern, and Outer Channel (Figure 3) based on varying salinity dynamics, depth and nature of the lake water. Magarmukh acts as the gateway between the main lake and the outer channel.

Sampling and data analysis

The ichthyofaunal inventory and biodiversity assessment was carried out from September 2000 to March 2014 following the methodology of Mohapatra et al. (2007). Specimens were collected from six major fish landing centres (Bhusandapur, Kalupadaghat, Sorona, Balugaon, Palur and Arakhakuda) and from five fishing grounds (FG 1, 2, 3, 4 and 5) in the lake as shown in Figure 3, resulting in 10 sampling stations in total. As far as possible, collections were identified in the field.

Specimens that could not be identified in the field were placed on ice and taken to the laboratory of Wetland Research and Training Centre (WRTC) of CDA and identified following Fischer and Bianchi (1984), Talwar and Kacker (1984), Talwar and Jhingran (1991), De Bruin et al. (1994), Mishra and Krishnan (1997), Venkateswaralu (1990), Krishnan and Mishra (2001), Barman et al. (2007), Rao (2009), Jayaram (2010) and Froese and Pauly (2015). All collections, after identification, were deposited with a voucher number, organization and year in the fish museum of the Wetland Research and Training Centre (WRTC) of Chilika Development Authority (CDA).

An updated, comprehensive, checklist of fishes reported from Chilika Lake from 1916 to 2014 (98 years) with their current valid names, common English names and succinct information on the current status of species, environment, interest to fisheries, ornamental value, conservation status, conservation category, resident and migratory nature, and endemism was prepared after verification with published literature and web based information such as FishBase (Froese and Pauly 2015) and the Catalog of Fishes (Eschmeyer 2014). The classification adopted mainly follows Eschmeyer and Fong (2014) and Nelson (2006), with genera and species

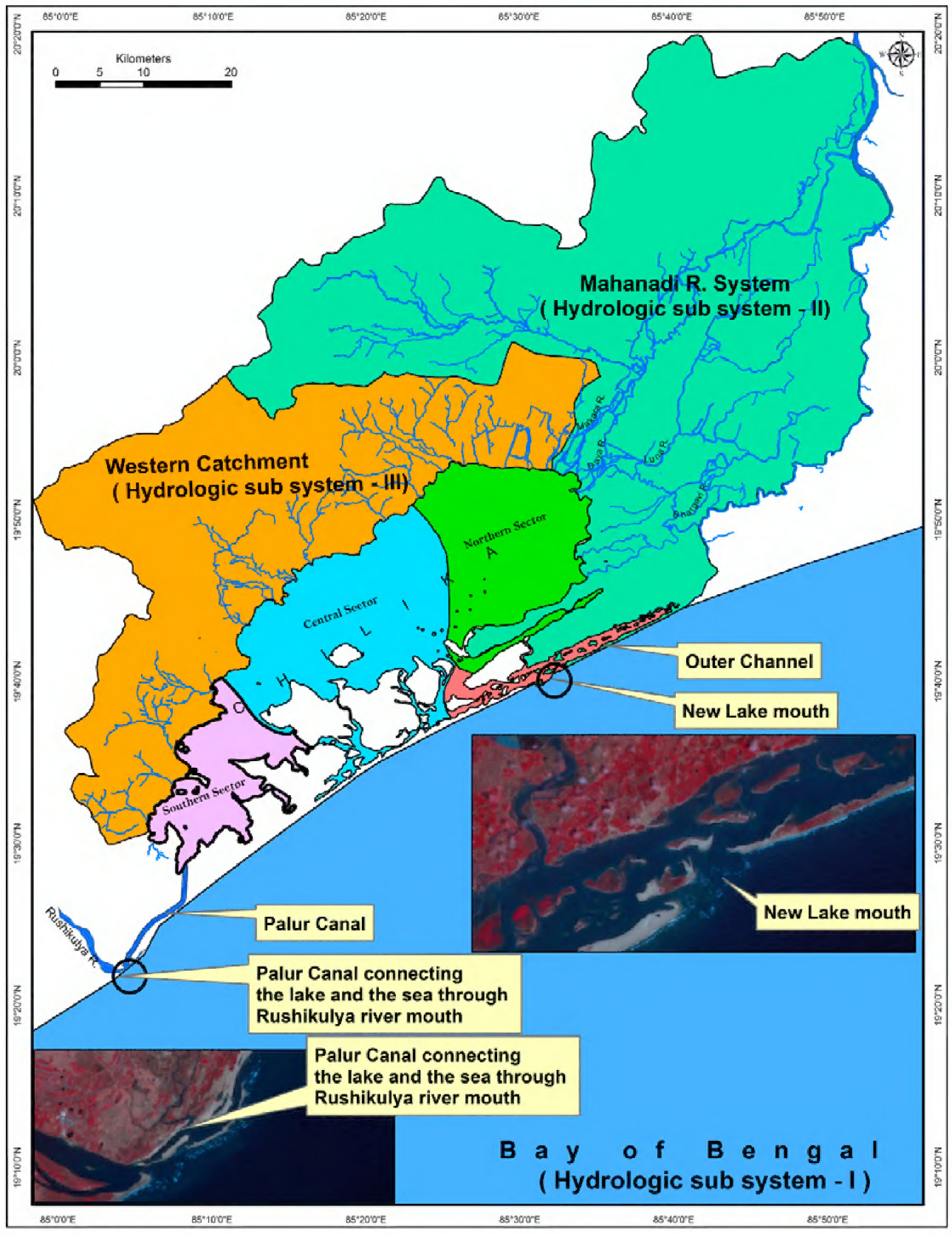
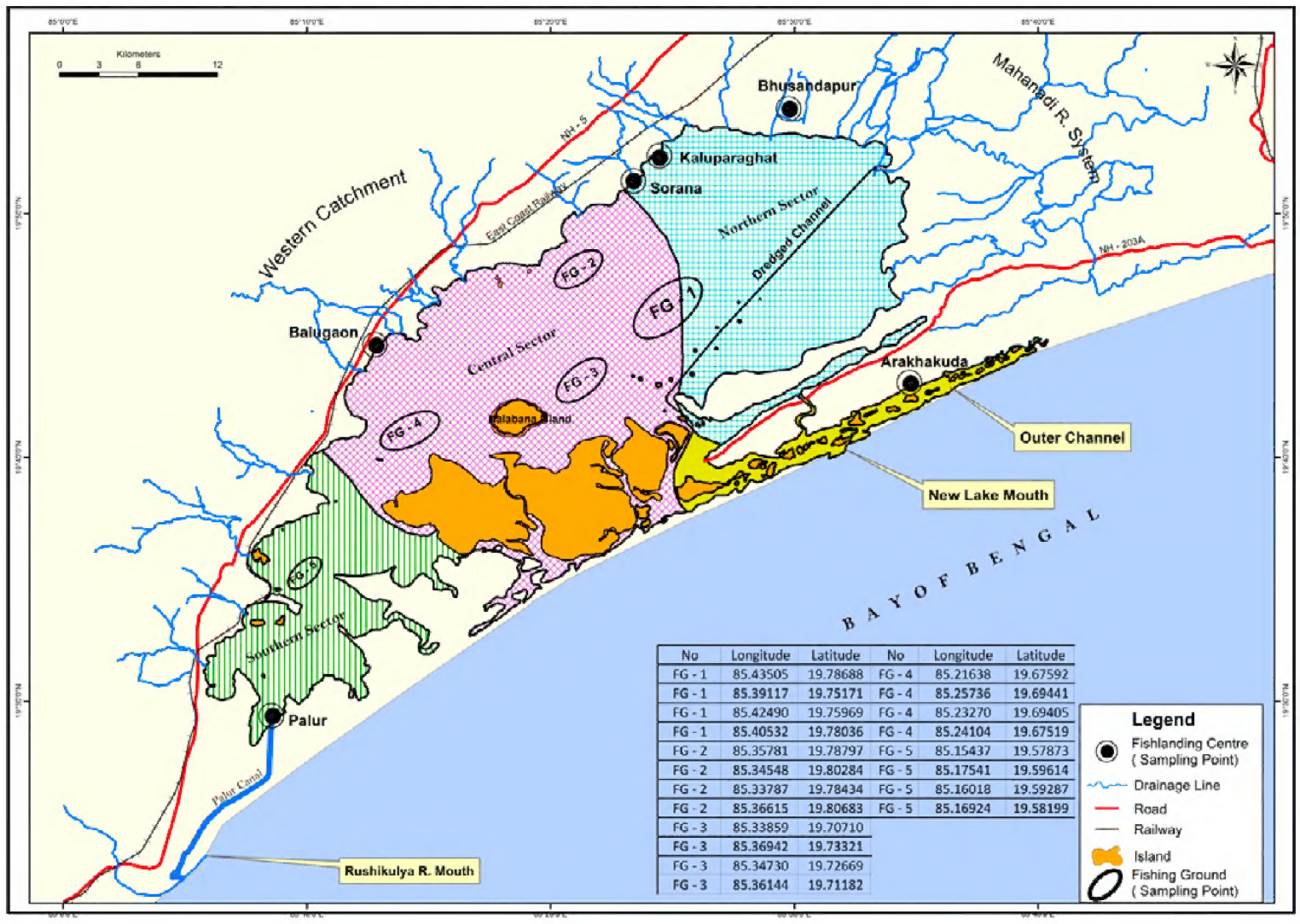


Figure 2. Drainage basin of Chilika Lake with three hydrologic subsystems indicat



No	Longitude	Latitude	No	Longitude	Latitude
FG - 1	85.43505	19.78688	FG - 4	85.21638	19.67592
FG - 1	85.39117	19.75171	FG - 4	85.25736	19.69441
FG - 1	85.42490	19.75969	FG - 4	85.23270	19.69405
FG - 1	85.40532	19.78036	FG - 4	85.24104	19.67519
FG - 2	85.35781	19.78797	FG - 5	85.15437	19.57873
FG - 2	85.34548	19.80284	FG - 5	85.17541	19.59614
FG - 2	85.33787	19.78434	FG - 5	85.16018	19.59287
FG - 2	85.36615	19.80683	FG - 5	85.16924	19.58199
FG - 3	85.33859	19.70710			
FG - 3	85.36942	19.73321			
FG - 3	85.34730	19.72669			
FG - 3	85.36144	19.71182			

Figure 3. Ichthyofaunal sampling stations in Chilika Lake.

arranged alphabetically. With a view to resolving some taxonomic issues, Kottelat (2013) was consulted.

The conservation status for the species was gathered from the IUCN Red List (IUCN 2014) as well as Ponniah (1993), Molur and Walker (1998), Menon (2004), Barman et al. (2007) and Lakra et al. (2010).

With a view to understanding the impact of environmental factors on ichthyofaunal diversity, secondary data for water quality parameters for both pre- and post-restoration periods were collected from the Chilika Development Authority, Bhubaneswar.

RESULTS AND DISCUSSION

Species diversity

An updated checklist of fishes reported from Chilika Lake (Table 1) during the last 84 years of pre-restoration (1916–2000) and 14 years of post-restoration (2000–2014) results in a total of 317 valid species (18 cartilaginous and 299 bony fishes) belonging to 207 genera, 88 families and 23 orders (Table 2). These are inclusive of 77 new records made during the post-restoration period. Eschmeyer and Fong (2014) considered the family Mugilidae as Perciformes and placed this family between Cepolidae and Cichlidae. However, Nelson (2006) placed this family in Mugiliformes, as did Froese and Pauly (2014) and that classification is followed here. One sparid species, *Acanthopagrus latus,* earlier recorded from Chilika Lake was later considered as *Acanthopagrus longispinnis*. Similarly, the name of the Indian species, *Lutjanus russellii* (Lutjanidae) was reassigned as *Lutjanus indicus* (Allen et al. 2013). The Indian snapper *Lutjanus indicus* was invariably confused with its sibling species *L. russellii* (Allen et al. 2013). Species collected during surveys carried out during the post-restoration period are indicated with single asterisk (*) and new records collected during the same period are indicated with double asterisks (**); thus the checklist includes 178 earlier reported species and 77 new records (Mohapatra et al. 2007; Mohanty et al. 2007; Satpathy and Panda 2009; Mohapatra et al. 2013 and 2014) made during the post-restoration period totaling 255 collected out of 317 species known from the lake, accounting for a 80.44%

Table 1. Checklist of fishes reported from Chilika Lake (1916–2014). ** New records during post-restoration period (*n*=77). * Inventory during post-restoration period (*n*=178+77=255). Recorded species but not collected (*n*=62).

Taxon	Common Name	Habitat	Conservation Status	Voucher	Faunal characteristics
Class Chondrichthyes					
Subclass Elasmobranchii (Cartilaginous fishes)					
Order Orectolobiformes					
Family Hemiscyllidae (Bamboo sharks)					
Genus *Chiloscyllium* Müller, Henle 1837					
Chiloscyllium indicum (Gmelin, 1789)**	Slender Bambooshark	MBF	NT$^{\Delta}$	CDA/229/2009	Mg
Order Carcharhiniformes					
Family Carcharhinidae (Requiem sharks)					
Genus *Carcharhinus* Blainville 1816					
Carcharhinus leucas (Muller, Henle, 1839)**	Bull Shark	MBF	NT$^{\Delta}$	CDA/230/2009	Mg,Ci
Carcharhinus limbatus (Muller, Henle, 1839)	Blacktip Shark	BM	NT$^{\Delta}$		Mg,Ci
Carcharhinus melanopterus (Quoy, Gaimard, 1824)	Blacktip Reef Shark	BM	NT$^{\Delta}$		Mg,Ci
Genus *Glyphis* Agassiz, 1843					
Glyphis gangeticus (Muller, Henle, 1839)	Ganges Shark	MBF	CR$^{\Delta}$		Mg
Genus *Scoliodon* Müller, Henle 1837					
Scoliodon laticaudus (Muller, Henle, 1838)*	Spadenose Shark	MB	NT$^{\Delta}$	CDA/001/2001	Mg
Family Sphyrnidae (Hammerheaded shark)					
Genus *Eusphyra* Gill, 1862					
Eusphyra blochii (Cuvier, 1816)**	Winghead Shark	MB	NT$^{\Delta}$	CDA/002/2001	Mg,Ci
Genus *Sphyrna* Rafinesque 1810					
Sphyrna lewini (Griffith, Smith, 1834)**	Scalloped Hammerhead	MB	EN$^{\Delta}$	CDA/003/2001	Mg
Order Pristiformes					
Family Pristidae (Saw fish)					
Genus *Pristis* Linck 1790					
Pristis clavata (Garman, 1906)	Smalltooth Sawfish	MB	EN$^{\Delta}$		Mg
Order Rajiformes					
Family Rhinobatidae (Guitar fishes)					
Genus *Rhynchobatus* Müller, Henle 1837					
Rhynchobatus djiddensis (Forsskal, 1775)**	Giant Guitarfish	MB	VU$^{\Delta,B}$	CDA/068/2002	Mg
Order Myliobatiformes					
Family Dasyatidae (Stingrays)					
Genus *Himantura* Müller, Henle 1837					
Himantura imbricata (Bloch, Schneider, 1801)*	Scaly Whipray	MB	DD$^{\Delta}$	CDA/254/2014	Rs, BC
Himantura marginata (Blyth, 1860)**	Blackedge Whipray	MB	DD$^{\Delta}$	CDA/004/2001	Mg
Himantura uarnak (Gmelin, 1789)*	Honeycomb Stingray	MB	VU$^{\Delta}$	CDA/005/2001	Mg
Himantura walga (Muller, Henle, 1841)*	Dwarf Whipray	M	NT$^{\Delta}$	CDA/006/2001	Mg
Genus *Pastinachus* Rüppell 1829					
Pastinachus sephen (Forsskal, 1775)*	Cowtail Stingray	BM	DD$^{\Delta}$	CDA/007/2001	Mg, Or, BC
Family Myliobatidae (Eaglerays)					
Genus *Aetobatus* Blainville, 1816					
Aetobatus flagellum (Bloch, Schneider, 1801)*	Longheaded Eagle Ray	BM	EN$^{\Delta}$	CDA/069/2002	Mg

Continued

Table 1. *Continued.*

Taxon	Common Name	Habitat	Conservation Status	Voucher	Faunal characteristics
Aetobatus ocellatus (Kuhl, 1823)*	Spotted Eagle Ray	BM	NE	CDA/070/2002	Mg, BC
Genus *Aetomylaeus* Garman, 1908					
Aetomylaeus nichofii (Bloch, Schneider, 1801)*	Banded Eagle Ray	BM	VU[Δ,B]	CDA/071/2002	Mg
Class Osteichthyes (Bony fishes)					
Subclass Actinopterygii					
Subdivision Teleostei					
Order Osteoglossiformes					
Family Notopteridae (Featherbacks)					
Genus *Chitala* Fowler 1934					
Chitala chitala (Hamilton, 1822)*	Clown Knifefish	F	EN[CAMP]	CDA/252/2013	Mg,Ci,Or
Genus *Notopterus* Lacepède 1800					
Notopterus notopterus (Pallas, 1769)*	Bronze Featherback	FB	LC[Δ]	CDA/008/2001	Rs, Ci, Or, BC
Order Elopiformes					
Family Elopidae (Tenpounders)					
Genus *Elops* Linnaeus 1766					
Elops machnata (Forsskal, 1775)*	Tenpounder	BM	LC[Δ]	CDA/072/2002	Mg,Ci
Family Megalopidae (Tarpons)					
Genus *Megalops* Lacèpede 1803					
Megalops cyprinoides (Broussonet, 1782)*	Indo-Pacific Tarpon	BM	DD[Δ]	CDA/073/2002	Mg,Ci
Order Anguilliformes					
Family Anguillidae (Freshwater eels)					
Genus *Anguilla* Schrank 1798					
Anguilla bengalensis (Gray, 1831)*	Indian Mottled Eel	FB	NT[Δ]	CDA/235/2010	Mg, Or, Ci
Anguilla bicolor bicolor McClelland, 1844*	Indonesian Shortfin Eel	FB	NT[Δ]	CDA/236/2010	Mg, Or, Ci
Family Muraenidae (Moray eels)					
Genus *Strophidon* McClelland 1844					
Strophidon sathete (Hamilton, 1822)*	Slender Giant Moray	MB	NE	CDA/139/2003	Mg
Family Ophichthidae (Snake eels)					
Genus *Lamnostoma* Kaup 1856					
Lamnostoma orientalis (McClelland, 1844)	Oriental Worm-eel	BM	LC[Δ]		Mg
Genus *Pisodonophis* Kaup 1856					
Pisodonophis boro (Hamilton, 1822)*	Rice-Paddy Eel	BM	LC[Δ]	CDA/074/2002	Mg, NFF
Pisodonophis cancrivorus (Richardson, 1848)	Longfin Snake-eel	MBF	NE		Rs, NFF
Family Muraenesocidae (Pike congers)					
Genus *Congresox* Gill 1890					
Congresox talabonoides (Bleeker, 1853)*	Indian Pike Conger	B	VU[M,B]	CDA/201/2008	Mg
Genus *Muraenesox* McClelland 1844					
Muraenesox bagio (Hamilton, 1822)**	Common Pike Conger	M	NE	CDA/075/2002	Mg
Muraenesox cinereus (Forsskal, 1775)*	Daggertooth Pike Conger	MB	VU[M,B]	CDA/076/2002	Mg
Order Clupeiformes					
Family Dussumieridae					
Genus *Dussumieria* Valencienes 1847					
Dussumieria acuta Valenciennes, 1847	Rainbow Sardine	M	NE		Mg
Dussumieria elopsoides Bleeker, 1849**	Slender Rainbow Sardine	M	NE	CDA/078/2002	Mg,Ci
Family Clupeidae (Herrings, allies)					
Genus *Amblygaster* Bleeker 1849					
Amblygaster leiogaster (Valenciennes, 1847)**	Smoothbelly Sardinella	M	NE	CDA/202/2008	Mg
Amblygaster sirm (Walbaum, 1792)	Spotted Sardinella	M	NE		Mg,Ci
Genus *Anodontostoma* Bleeker 1849					
Anodontostoma chacunda (Hamilton, 1822)*	Chacunda Gizzard Shad	M	NE	CDA/077/2002	Mg,Ci
Genus *Corica* (Hamilton 1822)					
Corica soborna Hamilton, 1822*	Ganges River Sprat	B	LC[Δ]	CDA/242/2011	Mg
Genus *Ehirava* Deraniyagala 1929					
Ehirava fluviatilis Deraniyagala, 1929**	Malabar Sprat	B	NE	CDA/079/2002	Mg
Genus *Escualosa* Whitley 1940					
Escualosa thoracata (Valenciennes, 1847)*	White Sardine	M	NE	CDA/161/2004	Mg
Genus *Gonialosa* Regan 1917					
Gonialosa manmina (Hamilton, 1822)*	Ganges River Gizzard Shad	F	VU[CAMP]	CDA/174/2005	Mg,Or
Genus *Gudusia* Fowler 1911					
Gudusia chapra (Hamilton, 1822)*	Indian River Shad	F	LC[Δ]	CDA/183/2006	Mg,Or
Genus *Hilsa* Regan 1917					
Hilsa kelee (Cuvier, 1829)*	Kelee Shad	MB	NE	CDA/140/2003	Mg, Ci, BC
Genus *Nematalosa* Regan 1917					
Nematalosa nasus (Bloch, 1795)*	Bloch's Gizzard Shad	BM	LC[Δ]	CDA/009/2001	Rs, Ci, BC
Genus *Sardinella* Valenciennes 1847					
Sardinella fimbriata (Valenciennes, 1847)**	Frimgescale Sardinella	MB	NE	CDA/010/2001	Mg,Ci
Sardinella longiceps (Valenciennes, 1847)**	Indian Oilsardine	M	LC[Δ]	CDA/011/2001	Mg,Ci
Sardinella melanura (Cuvier, 1829)	Blacktip Sardinella	M	NE		Mg
Genus *Tenualosa* Fowler 1934					
Tenualosa ilisha (Hamilton, 1822)*	Hilsa Shad	MB	VU[NBFGR,B]	CDA/012/2001	Mg,Ci, Hvt
Tenualosa toli (Valenciennes, 1847)**	Toli Shad	MBF	NE	CDA/203/2008	Mg,Ci
Family Engraulidae (Anchovies)					
Genus *Setipinna* Swainson 1839					
Setipinna phasa (Hamilton, 1822)	Gangetic Hairfin Anchovy	FB	LC[Δ]		Rs, BC
Genus *Stolephorus* Lacepède 1803					
Stolephorus baganensis Hardenberg, 1933*	Bagan Anchovy	BM	NE	CDA/080/2002	Mg

Continued

Table 1. *Continued.*

Taxon	Common Name	Habitat	Conservation Status	Voucher	Faunal characteristics
Stolephorus commersonnii Lacepede, 1803*	Commerson's Anchovy	BM	NE	CDA/081/2002	Mg,Ci
Stolephorus dubiosus Wongratana, 1983*	Thai Anchovy	BM	NE	CDA/082/2002	Mg
Stolephorus indicus (Van Hasselt, 1823)*	Indian Anchovy	BM	NE	CDA/013/2001	Rs, BC
Genus *Thryssa* Jorda, Seale 1925					
Thryssa gautamiensis Babu Rao, 1971**	Gautama Thryssa	BM	DD$^{\Delta}$	CDA/083/2002	Mg
Thryssa hamiltonii Gray, 1835*	Hamilton's Thryssa	BM	NE	CDA/084/2002	Mg
Thryssa kammalensoides Wongratana, 1983	Godavari Thryssa	B	NE		Rs,BC
Thryssa malabarica (Bloch, 1795)*	Malabar Thryssa	BM	NE	CDA/085/2002	Mg
Thryssa mystax (Bloch, Schneider, 1801)*	Moustached Thryssa	BM	LC$^{\Delta}$	CDA/086/2002	Mg
Thryssa polybranchialis Wongratana, 1983*	Humphead Thryssa	M	NE	CDA/014/2001	Rs, BC
Thryssa purava (Hamilton, 1822)*	Oblique-jaw Thryssa	BM	NE	CDA/015/2001	Mg, BC
Thryssa setirostris (Broussonet, 1782)**	Long-jaw Thryssa	BM	NE	CDA/087/2002	Mg
Thryssa vitrirostris (Gilchrist, Thompson, 1908)**	Orangemouth Anchovy	BM	NE	CDA/204/2008	Mg
Family Chirocentridae (Wolf herrings)					
Genus *Chirocentrus* Cuvier 1816					
Chirocentrus dorab (Forsskal, 1775)	Dorab Wolf-herring	MB	NE		Mg
Family Pristigasteridae (Pellonas)					
Genus *Ilisha* Richardson 1846					
Ilisha elongata (Anonymous [Bennett], 1830)**	Elongate Ilisha	BM	NE	CDA/088/2002	Mg,Ci
Ilisha megaloptera (Swainson, 1839)*	Big Eye Ilisha	MBF	EN^{NBFGR}	CDA/016/2001	Mg, Ci, BC
Ilisha melastoma (Bloch, Schneider, 1801)	Indian Ilisha	BM	NE		Mg
Genus *Opisthopterus* Gill 1861					
Opisthopterus tardoore (Cuvier, 1829)**	Tardoore	BM	NE	CDA/205/2008	Mg
Order Gonorynchiformes					
Family Chanidae (Milkfish)					
Genus *Chanos* Lacepède 1803					
Chanos chanos (Forsskal, 1775)*	Milkfish	MB	NE	CDA/017/2001	Mg,Ci
Order Cypriniformes					
Family Cyprinidae (Carps, minnows)					
Genus *Amblypharyngodon* Bleeker 1860					
Amblypharyngodon mola (Hamilton, 1822)*	Mola Carplet	F	LC$^{\Delta}$	CDA/231/2009	Mg,Ci,Or
Genus *Bangana* Hamilton 1822					
Bangana ariza (Hamilton, 1807)	Reba	F	LC$^{\Delta}$		Mg, Ci
Genus *Chela* (Hamilton 1822)					
Chela cachius (Hamilton, 1822)*	Silver Hatchet Chela	F	LC$^{\Delta}$	CDA/184/2006	Rs,Or
Genus *Cirrhinus* (Oken 1817)					
Cirrhinus mrigala (Hamilton, 1822)*	Mrigal Carp (Indian ajorcarp)	F	LC$^{\Delta}$	CDA/163/2004	Mg,Ci
Cirrhinus reba (Hamilton, 1822)*	Reba Carp	F	VU^{CAMP}	CDA/237/2010	Mg,Ci,Or
Genus *Crossocheilus* Kuhl, van Hasselt 1823					
Crossocheilus latius (Hamilton, 1822)*	Stone Roller	F	VU^{NBFGR}	CDA/089/2002	Rs,Or
Genus *Danio* Hamilton 1822					
Danio rerio (Hamilton, 1822)	Zebra Danio	F	LC$^{\Delta}$		Mg, Or, BC
Genus *Esomus* Swainson 1839					
Esomus danricus (Hamilton, 1822)*	Flying Barb	F	LC$^{\Delta}$	CDA/090/2002	Rs,Or,BC
Genus *Gibelion* Heekel 1843					
Gibelion catla (Hamilton, 1822)*	Catla	F	VU^{CAMP}	CDA/162/2004	Mg,Ci
Genus *Labeo* Cuvier 1816					
Labeo boga (Hamilton, 1822)**	Boga Labeo	F	LC$^{\Delta}$	CDA/091/2002	Mg,Ci,Or
Labeo calbasu (Hamilton, 1822)*	Orangefin Labeo	F	LC$^{\Delta}$	CDA/243/2011	Mg,Ci,Or
Labeo gonius (Hamilton, 1822)**	Kuria Labeo	F	LC$^{\Delta}$	CDA/092/2002	Mg,Ci,Or
Labeo rohita (Hamilton, 1822)*	Roho Labeo	F	LC$^{\Delta}$	CDA/093/2002	Mg,Ci
Genus *Laubuka* Bleeker, 1860					
Laubuka laubuca (Hamilton, 1822)*	Indian Glass Barb	F	LC$^{\Delta}$	CDA/141/2003	Mg,Or
Genus *Osteobrama* Heckel 1843					
Osteobrama peninsularis Silas, 1952**	Peninsular Osteobrama	F	DD$^{\Delta}$	CDA/018/2001	Mg,Or
Osteobrama vigorsii (Sykes, 1839)	Godavari Osteobrama	F	LC$^{\Delta}$		Mg,Or
Genus *Pethia* Meegaskumbura, Maduwage 2012					
Pethia ticto (Hamilton, 1822)*	Ticto Barb	F	LC$^{\Delta}$	CDA/019/2001	Rs, Or, BC
Genus *Puntius* Hamilton 1822					
Puntius chola (Hamilton, 1822)*	Swamp Barb	F	LC$^{\Delta}$	CDA/020/2001	Rs,Or
Puntius sophore (Hamilton, 1822)*	Pool Barb	F	LC$^{\Delta}$	CDA/021/2001	Rs,Or
Puntius vittatus Day, 1865	Greenstripe Barb	F	LC$^{\Delta}$		Mg,Or
Genus *Rasbora* Bleeker 1859					
Rasbora daniconius (Hamilton, 1822)*	Slender Rasbora	F	LC$^{\Delta}$	CDA/094/2002	Mg,Or
Rasbora rasbora (Hamilton, 1822)*	Gangetic Scissortail Rasbora	F	LC$^{\Delta}$	CDA/095/2002	Mg,Or
Genus *Salmostoma* Swainson 1839					
Salmostoma bacaila (Hamilton, 1822)*	Large Razorbelly Minnow	F	LC$^{\Delta}$	CDA/096/2002	Mg,Or
Genus *Systomus* McClelland 1839					
Systomus sarana (Hamilton, 1822)*	Olive Barb	F	LC$^{\Delta}$	CDA/142/2003	Mg,Ci,Or
Family Cobitidae (Loaches)					
Genus *Lepidocephalichthys* Bleeker 1863					
Lepidocephalichthys guntea (Hamilton, 1822)	Guntea Loach	F	LC$^{\Delta}$		Mg,Or
Order Siluriformes					
Family Bagridae (Bagrid catfishes)					
Genus *Mystus* Scopoli 1777					
Mystus cavasius (Hamilton, 1822)*	Gangetic Mystus	FB	LC$^{\Delta}$	CDA/022/2001	Mg,Or

Continued

Table 1. *Continued.*

Taxon	Common Name	Habitat	Conservation Status	Voucher	Faunal characteristics
Mystus gulio (Hamilton, 1822)*	Long Whiskers Catfish	BF	LC$^{\Delta}$	CDA/023/2001	Rs,Ci, Hvt,BC
Mystus vittatus (Bloch, 1794)*	Striped Dwarf Catfish	F	VU^{CAMP,B}	CDA/194/2007	Mg,Or,BC
Genus *Sperata* Holly 1939					
Sperata seenghala (Sykes 1839)*	Giant River-catfish	FB	LC$^{\Delta}$	CDA/232/2009	Mg,Ci,Or
Family Siluridae (Eurasian catfishes)					
Genus *Ompok* Lacepède 1803					
Ompok bimaculatus (Bloch, 1794)*	Butter Catfish	F	EN^{CAMP,B}	CDA/097/2002	Mg,Ci,Or
Ompok pabda (Hamilton, 1822)*	Pabdah Catfish	F	VU^{NBFGR}	CDA/024/2001	Mg,Ci,Or
Genus *Wallago* Bleeker 1851					
Wallago attu (Bloch, Schneider, 1801)*	Wallago	F	NT$^{\Delta}$	CDA/025/2001	Mg,Ci
Family Schilbeidae (Schilbid catfishes)					
Genus *Ailia* Gray 1830					
Ailia coila (Hamilton, 1822)*	Gangetic Ailia	F	VU^{CAMP,B}	CDA/098/2002	Mg,Ci
Genus *Eutropiichthys* Bleeker 1862					
Eutropiichthys vacha (Hamilton, 1822)	Batchwa Vacha	F	EN^{CAMP,B}		Mg,Ci,Or
Genus *Silonia* Swainson 1838					
Silonia silondia (Hamilton, 1822)	Silond Catfish	F	VU^{NBFGR}		Mg,Ci
Family Pangasiidae (Shark catfish)					
Genus *Pangasius* Valenciennes 1840					
Pangasius pangasius (Hamilton, 1822)*	Pangas Catfish, Yellowtail Catfish	F	VU^{NBFGR,B}	CDA/026/2001	Mg,Or
Family Sisoridae (Sisorid catfish)					
Genus *Bagarius* Bleeker 1854					
Bagarius bagarius (Hamilton, 1822)*	Goonch	F	VU^{NBFGR}	CDA/099/2002	Mg,Or
Bagarius yarrelli (Sykes, 1839)**	Goonch	F	EN^{NBFGR}	CDA/100/2002	Mg,Ci,Or
Family Clariidae (Air-breathing catfish)					
Genus *Clarias* Scopoli 1777					
Clarias magur (Hamilton, 1822)*	Walking Catfish, Magur	F	EN$^{\Delta}$	CDA/195/2007	Mg,Ci,Or
Family Heteropneustidae (Airsac catfish)					
Genus *Heteropneustes* Müller 1840					
Heteropneustes fossilis (Bloch, 1794)*	Stinging Catfish	F	VU^{NBFGR}	CDA/238/2010	Mg,Ci,Or
Family Ariidae (Sea catfish)					
Genus *Arius* Valenciennes 1840					
Arius arius (Hamilton, 1822)*	Threadfin Sea Catfish	B	LC$^{\Delta}$	CDA/027/2001	Mg, Ci
Arius maculatus (Thunberg, 1792)	Spotted Catfish	B	NE		Mg,Ci
Genus *Nemapteryx* Ogilby 1908					
Nemapteryx caelata (Valenciennes, 1840)*	Engraved Catfish	B	NE	CDA/206/2008	Mg, Ci, BC
Genus *Osteogeneiosus* Bleeker 1846					
Osteogeneiosus militaris (Linnaeus, 1758)*	Soldier Catfish	BM	NE	CDA/028/2001	Rs, Ci, BC
Genus *Plicofollis* Kailola 2004					
Plicofollis layardi (GÜnther, 1866)	Longsnouted Catfish	MB	NE		Mg,Ci
Family Plotosidae (Stinging catfishes)					
Genus *Plotosus* Lacepède 1803					
Plotosus canius Hamilton, 1822*	Gray Eel-catfish	B	NE	CDA/029/2001	Ci, Rs, BC
Plotosus lineatus (Thunberg, 1787)*	Striped Eel Catfish	B	NE	CDA/101/2002	Ci, Rs, Or, BC
Order Aulopiformes					
Family Synodontidae (Lizard fishes)					
Genus *Saurida* Valenciennes 1850					
Saurida tumbil (Bloch, 1795)**	Greater Lizardfish	M	NE	CDA/207/2008	Mg
Genus *Synodus* Scopoli 1777					
Synodus myops (Forster, 1801)**	Snakefish	MB	NE	CDA/102/2002	Mg
Order Mugiliformes					
Family Mugilidae (Mullets)					
Genus *Ellochelon* Whitley 1930					
Ellochelon vaigiensis (Quoy, Gaimard, 1825)	Squaretail Mullet	BM	LC$^{\Delta}$		Mg,Ci,Or
Genus *Liza* Jordan, Swain 1884					
Liza macrolepis (Smith, 1846)*	Largescale Mullet	BM	LC$^{\Delta}$	CDA/126/2002	Mg,Ci, Hvt
Liza melinopterus (Valenciennes, 1836)*	Otomebora Mullet	BM	LC$^{\Delta}$	CDA/051/2001	Mg,Ci
Liza parsia (Hamilton, 1822)*	Goldspot Mullet	BM	NE	CDA/153/2003	Mg,Ci
Liza subviridis (Valenciennes, 1836)*	Greenback Mullet	MB	NE	CDA/127/2002	Mg, Ci, BC
Liza tade (Bloch, 1801)*	Tade Gray Mullet	MBF	DD$^{\Delta}$	CDA/171/2004	Mg,Ci
Genus *Moolgarda* Whitley 1945					
Moolgarda cunnesius (Valenciennes, 1836)*	Longarm Mullet	MB	NE	CDA/172/2004	Mg,Ci, Hvt,BC
Moolgarda seheli (Forsskal, 1775)*	Bluespot Mullet	MB	NE	CDA/052/2001	Mg,Ci
Moolgarda speigleri (Bleeker, 1858)*	Speigler's Mullet	MB	NE	CDA/055/2001	Mg,Ci
Genus *Mugil* Linnaeus 1758					
Mugil cephalus Linnaeus, 1758*	Flathead Gray Mullet	BM	LC$^{\Delta}$	CDA/053/2001	Mg,Ci, Hvt
Genus *Rhinomugil* Gill 1863					
Rhinomugil corsula (Hamilton, 1822)*	Corsula	BF	VU^{NBFGR,B}	CDA/054/2001	Mg,Ci,Or,BC
Order Atheriniformes					
Family Atherinidae (Old World silversides)					
Genus *Atherinomorus* Fowler 1903					
Atherinomorus duodecimalis (Valenciennes, 1835)**	Tropical Silverside	BM	NE	CDA/030/2001	Mg
Atherinomorus lacunosus (Forster, 1801)**	Wide-banded Hardyhead Silverside	BM	NE	CDA/031/2001	Mg
Order Cyprinodontiformes					
Family Aplocheilidae (Asian revulines)					
Genus *Aplocheilus* McClelland 1839					

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Table 1. *Continued.*

Taxon	Common Name	Habitat	Conservation Status	Voucher	Faunal characteristics
Aplocheilus panchax (Hamilton, 1822)*	Blue Panchax, Striped Panchax, Golden Wonder Killifish	FB	LC$^{\Delta}$	CDA/244/2011	Rs, Or, BC
Order Beloniformes					
Family Belonidae (Needle fishes)					
Genus *Strongylura* van Hasselt 1824					
Strongylura leiura (Bleeker, 1850)*	Banded Needlefish	B	NE	CDA/208/2008	Rs,Or
Strongylura strongylura (Van Hasselt, 1823)*	Spottail Needlefish	BF	NE	CDA/103/2002	Rs,Or, Hvt, BC
Genus *Xenentodon* Regan 1911					
Xenentodon cancila (Hamilton, 1822)*	Freshwater Garfish	FB	LC$^{\Delta}$	CDA/032/2001	Mg,Or
Family Hemiramphidae (Halfbeaks)					
Genus *Hemiramphus* Cuvier 1816					
Hemiramphus far (Forsskal, 1775)**	Black-barred Halfbeak	BM	NE	CDA/209/2008	Mg, Ci, BC
Genus *Hyporhamphus* Gill 1859					
Hyporhamphus limbatus (Valenciennes, 1847)*	Congaturi Halfbeak	BF	LC$^{\Delta}$	CDA/033/2001	Rs,Or, Hvt, BC
Family Adrianichthydae (Adrianichthyids)					
Genus *Oryzias* Jordan, Snyder 1906					
Oryzias dancena (Hamilton, 1822)*	Estuarine Ricefish	BF	LC$^{\Delta}$	CDA/245/2011	Rs, Or, BC
Order Syngnathiformes					
Family Syngnathidae (Pipe fishes, Sea horses)					
Genus *Hippichthys* Bleeker 1849					
Hippichthys cyanospilos (Bleeker, 1854)**	Blue-spotted Pipefish	BF	NE	CDA/104/2002	Rs, Or, BC, NFF
Genus *Hippocampus* Rafinesque 1810					
Hippocampus fuscus Ruppell, 1838*	Sea Pony	B	VU^{B}	CDA/164/2004	Rs, Or, BC, NFF
Genus *Ichthyocampus* Kaup 1853					
Ichthyocampus carce (Hamilton, 1822)*	Freshwater Pipefish	FB	LC$^{\Delta}$	CDA/143/2003	Rs, Or, BC, NFF
Order Synbranchiformes					
Family Synbranchidae (Swamp eels)					
Genus *Ophisternon* McClelland 1844					
Ophisternon bengalense McClelland, 1844**	Bengal Eel	FB	LC$^{\Delta}$	CDA/105/2002	Rs, BC
Family Mastacembelidae (Spiny eels)					
Genus *Macrognathus* Lacepède 1800					
Macrognathus aral (Bloch, Schneider, 1801)*	One-stripe Spinyeel	FB	LC$^{\Delta}$	CDA/239/2010	Ci, Rs, Or, BC
Macrognathus pancalus Hamilton, 1822*	Barred Spiny Eel	FB	LC$^{\Delta}$	CDA/240/2010	Ci, Rs, Or, BC
Genus *Mastacembelus* Scopoli 1777					
Mastacembelus armatus (Lacepede, 1800)*	Zig-zag Eel	FB	LC$^{\Delta}$	CDA/144/2003	Mg,Ci,Or
Order Scorpaeniformes					
Family Scorpaenidae (Scorpion fishes)					
Genus *Pterois* Oken 1817					
Pterois radiata Cuvier, 1829*	Radial Firefish	M	NE	CDA/106/2002	M,Mg,Or, NFF
Family Tetrarogidae (Waspfishes)					
Genus *Tetraroge* Günther 1860					
Tetraroge niger (Cuvier, 1829)**	Wasp Fish	M	LC$^{\Delta}$	CDA/145/2003	Mg, NFF
Family Platycephalidae (Flatheads)					
Genus *Cociella* Whitley 1940					
Cociella crocodilus (Cuvier, 1829)**	Crocodile Flathead	MB	NE	CDA/210/2008	Mg
Genus *Kumococius* Matsubara, Ochiai 1955					
Kumococius rodericensis (Cuvier, 1829)**	Spiny Flathead	M	NE	CDA/211/2008	Mg
Genus *Platycephalus* Bloch 1795					
Platycephalus indicus (Linnaeus, 1758)*	Bartail Flathead	BM	DD$^{\Delta}$	CDA/034/2001	Mg
Order Perciformes					
Family Ambassidae (Perchlets, glass fishes)					
Genus *Ambassis* Cuvier 1828					
Ambassis ambassis (Lacepede, 1802)*	Commerson's Glassy	BF	LC$^{\Delta}$	CDA/246/2011	Mg,Or
Ambassis gymnocephalus (Lacepede, 1802)*	Bald Glassy	BF	LC$^{\Delta}$	CDA/107/2002	Mg, Or, BC
Genus *Chanda* Hamilton 1822					
Chanda nama Hamilton, 1822*	Elongate Glass-perchlet	FB	LC$^{\Delta}$	CDA/035/2001	Mg,Or
Genus *Parambassis* Bleeker 1874					
Parambassis ranga (Hamilton, 1822)*	Indian Glassy Fish	FB	LC$^{\Delta}$	CDA/146/2003	Rs, Or, BC
Family Latidae (Lates perches/Asian Seabass)					
Genus *Lates* Cuvier 1828					
Lates calcarifer (Bloch, 1790)*	Barramundi	BF	VU^{P}	CDA/036/2001	Mg,Ci, Hvt
Family Serranidae (Groupers, Rock-cods)					
Genus *Epinephelus* Bloch 1793					
Epinephelus coioides (Hamilton, 1822)**	Orange-spotted Grouper	MB	NT$^{\Delta}$	CDA/165/2004	Mg,Ci
Epinephelus lanceolatus (Bloch, 1790)	Giant Grouper	MB	VU$^{\Delta,B}$		Mg,Ci,Or
Epinephelus malabaricus (Bloch, Schneider, 1801)**	Malabar Grouper	MB	NT$^{\Delta}$	CDA/212/2008	Mg,Ci
Epinephelus tauvina (Forsskal, 1775)*	Greasy Grouper	M	DD$^{\Delta}$	CDA/213/2008	Mg,Ci
Family Sillaginidae (Smealt whitings)					
Genus *Sillaginopsis* Gill 1861					
Sillaginopsis panijus (Hamilton, 1822)	Flathead Sillago	MB	NE		Mg,Ci,Or
Genus *Sillago* Cuvier 1816					
Sillago sihama (Forsskal, 1775)*	Silver Sillago	B	NE	CDA/038/2001	Ci,Mg, Hvt
Sillago vincenti Mc Kay, 1980**	Vincent's Sillago	B	NE	CDA/109/2002	Mg,Ci
Family Lactariidae (False trevallies)					
Genus *Lactarius* Valenciennes 1833					
Lactarius lactarius (Bloch, Schneider, 1801)**	False Trevally	MB	NE	CDA/215/2008	Mg

Continued

Table 1. *Continued.*

Taxon	Common Name	Habitat	Conservation Status	Voucher	Faunal characteristics
Family Rachycentridae (Cobias)					
Genus *Rachycentron* Kaup 1826					
Rachycentron canadum (Linnaeus, 1766)*	Cobia	MB	NE	CDA/039/2001	Mg,Ci
Family Echeneidae (Sharksuckers, Discfishes)					
Genus *Echeneis* Linnaeus 1758					
Echeneis naucrates Linnaeus, 1758*	Live Sharksucker	MB	NE	CDA/147/2003	Mg,Or
Family Carangidae (Jacks, Trevallies, Pompanos, Scads)					
Genus *Alectis* Rafinesque 1815					
Alectis indica (Ruppell, 1830)*	Indian Threadfish	MB	NE	CDA/185/2006	Mg,Ci,Or
Genus *Alepes* Swainson 1839					
Alepes djedaba (Forsskal, 1775)*	Shrimp Scad	M	NE	CDA/110/2002	Mg,Ci
Genus *Atule* Jordan, Jordan 1922					
Atule mate (Cuvier, 1833)*	Yellowtail Scad	MB	NE	CDA/216/2008	Mg,Ci
Genus *Carangoides* Bleeker 1851					
Carangoides gymnostethus (Cuvier, 1833)	Bludger Trevally	M	NE		Mg,Ci
Carangoides praeustus (Anonymous [Bennett], 1830)*	Brownback Trevally	M	NE	CDA/175/2005	Mg
Genus *Caranx* Lacepède 1801					
Caranx ignobilis (Forsskal, 1775)	Giant Trevally	MB	NE		Mg,Or
Caranx melampygus Cuvier, 1833	Bluefin Trevally	MB	NE		Mg,Ci,Or
Caranx sexfasciatus Quoy, Gaimard, 1825*	Bigeye Trevally	MB	LC$^{\Delta}$	CDA/176/2005	Mg,Ci
Genus *Megalaspis* Bleeker 1851					
Megalaspis cordyla (Linnaeus, 1758)*	Torpedo Scad	M	NE	CDA/111/2002	Mg,Ci
Genus *Parastromateus* Bleeker 1864					
Parastromateus niger (Bloch, 1795)	Black Pomfret	MB	NE		Mg,Ci
Genus *Scomberoides* Lacepède 1801					
Scomberoides commersonnianus Lacepede, 1801**	Talang Queenfish	MB	NE	CDA/112/2002	Mg,Ci
Scomberoides lysan (Forsskal, 1775)	Doublespotted Queenfish	MB	NE		Mg,Ci
Scomberoides tala (Cuvier, 1832)*	Barred Queenfish	M	NE	CDA/113/2002	Mg,Ci
Scomberoides tol (Cuvier, 1832)**	Needlescaled Queenfish	MB	NE	CDA/114/2002	Mg,Ci
Genus *Selar* Bleeker 1851					
Selar boops (Cuvier, 1833)**	Oxeye Scad	M	NE	CDA/217/2008	Mg
Selar crumenophthalmus (Bloch, 1793)**	Bigeye Scad	M	NE	CDA/115/2002	Mg,Ci
Genus *Selaroides* Bleeker 1851					
Selaroides leptolepis (Cuvier, 1833)*	Yellowstripe Scad	MB	NE	CDA/116/2002	Mg,Ci
Genus *Trachinotus* Lacepède 1801					
Trachinotus blochii (Lacepede, 1801)	Snubnose Pompano	MB	NE		Mg,Or,BC
Trachinotus mookalee Cuvier, 1832**	Indian Pompano	M	NE	CDA/117/2002	Mg
Family Leiognathidae (Pony fishes, Silverbellies)					
Genus *Aurigequulla* Fowler 1918					
Aurigequulla fasciatus (Lacepede, 1803)**	Striped Ponyfish	MB	NE	CDA/166/2004	Mg
Genus *Deveximentum* Fowler, 1904					
Deveximentum insidiator (Bloch, 1787)*	Pugnose Ponyfish	M	NE	CDA/179/2005	Mg
Deveximentum ruconius (Hamilton, 1822)**	Deep Pugnose Ponyfish	M	NE	CDA/118/2002	Mg
Genus *Eubleekeria* Fowler 1904					
Eubleekeria splendens (Cuvier, 1829)	Splendid Ponyfish	M	LC$^{\Delta}$		Mg
Genus *Gazza* Rüppell 1835					
Gazza minuta (Bloch, 1795)*	Toothpony	M	LC$^{\Delta}$	CDA/186/2006	Mg
Genus *Karalla* Chakrabarty, Sparks 2008					
Karalla daura (Cuvier, 1829)	Goldstripe Ponyfish	M	NE		Mg
Karalla dussumieri (Valenciennes, 1835)*	Dussumier's Ponyfish	M	NE	CDA/177/2005	Mg
Genus *Leiognathus* Lacepède 1802					
Leiognathus equulus (Forsskal, 1775)*	Common Ponyfish	MB	LC$^{\Delta}$	CDA/178/2005	Mg, BC
Genus *Nuchequula* Whitley 1932					
Nuchequula blochii (Valenciennes, 1835)*	Twoblotch Ponyfish	M	NE	CDA/148/2003	Mg
Nuchequula gerreoides (Bleeker, 1851)**	Decorated Ponyfish	MB	NE	CDA/149/2003	Mg
Genus *Photopectoralis* Sparks, Dunlap, Smith 2005					
Photopectoralis bindus (Valenciennes, 1835)**	Orangefin Ponyfish	M	NE	CDA/150/2003	Mg
Family Lutjanidae (Snappers)					
Genus *Lutjanus* Bloch 1790					
Lutjanus argentimaculatus (Forsskal, 1775)*	Mangrove Red Snapper	MBF	NE	CDA/040/2001	Mg,Ci
Lutjanus indicus Allen, White, Erdmann, 2013*	Indian Snapper	MB	NE	CDA/168/2004	Mg,Ci
Lutjanus johnii (Bloch, 1792)*	John's Snapper	MB	NE	CDA/041/2001	Mg,Ci
Lutjanus kasmira (Forsskal, 1775)*	Common Bluestripe Snapper	M	NE	CDA/167/2004	Mg,Ci
Family Datnioididae (Freshwater triple tails)					
Genus *Datnioides* Bleeker 1853					
Datnioides polota (Hamilton, 1822)*	Four-banded Tigerfish	FB	LC$^{\Delta}$	CDA/042/2001	Ci,Rs,Or,BC
Family Gerreidae (Silver biddies)					
Genus *Gerres* Quoy, Gaimard 1824					
Gerres erythrourus (Bloch, 1791)**	Deep-bodied Mojarra	MB	NE	CDA/180/2005	Mg,Ci
Gerres filamentosus Cuvier, 1829*	Whipfin Silver-biddy	MB	LC$^{\Delta}$	CDA/181/2005	Mg
Gerres limbatus Cuvier, 1830*	Saddleback Silver-biddy	MB	NE	CDA/169/2004	Mg
Gerres macracanthus Bleeker, 1854	Longspine Silverbiddy	MB	NE		Mg
Gerres oyena (Forsskal, 1775)*	Common Silver-biddy	MB	NE	CDA/043/2001	Mg
Gerres phaiya Iwatsuki, Heemstra, 2001*	Strongspine Silver-Biddy	MB	NE	CDA/233/2009	Mg
Gerres setifer (Hamilton, 1822)*	Small Bengal Silver-biddy	MB	NE	CDA/044/2001	Mg, BC

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Table 1. *Continued.*

Taxon	Common Name	Habitat	Conservation Status	Voucher	Faunal characteristics
Family Haemulidae (Grunts, Rubberlips)					
Genus *Plectorhinchus* Lacepède 1801					
Plectorhinchus gibbosus (Lacepède, 1802)	Harry Hotlips	M	LC[Δ]		Mg
Genus *Pomadasys* Lacepède 1802					
Pomadasys argenteus (Forsskal, 1775)*	Silver Grunt	MB	VU[B]	CDA/119/2002	Mg,Ci
Pomadasys kaakan (Cuvier, 1830)**	Javelin Grunter	MB	NE	CDA/120/2002	Mg,Ci
Pomadasys multimaculatus (Playfair, 1867)**	Cock Grunter	MB	NE	CDA/170/2004	Mg,Ci
Family Sparidae (Seabreams)					
Genus *Acanthopagrus* Peters 1855					
Acanthopagrus berda (Forsskal, 1775)*	Goldsilk Seabream	MB	NE	CDA/151/2003	Mg,Ci,Or
Acanthopagrus longispinnis Valenciennes, 1830	Bengal Yellowfin Seabream	MB	NE		Mg,Ci
Genus *Argyrops* Swainson 1839					
Argyrops spinifer (Forsskal, 1775)	King Soldier Bream	M	NE		Mg,Ci
Genus *Crenidens* Valenciennes 1830					
Crenidens crenidens (Forsskal, 1775)*	Karanteen Seabream	M	NE	CDA/045/2001	Mg,Ci
Genus *Rhabdosargus* Fowler 1933					
Rhabdosargus sarba (Forsskal, 1775)*	Goldlined Seabream	MB	NE	CDA/046/2001	Mg,Ci
Family Nemipteridae (Threadfin breams)					
Genus *Nemipterus* Swainson 1839					
Nemipterus japonicus (Bloch, 1791)**	Japanese Threadfin Bream	M	NE	CDA/218/2008	Mg
Family Sciaenidae (Croakers)					
Genus *Daysciaena* Talwar 1970					
Daysciaena albida (Cuvier, 1830)*	Bengal Corvina	MB	NE	CDA/047/2001	Mg,Ci, Hvt,BC
Genus *Dendrophysa* Trewavas 1964					
Dendrophysa russelii (Cuvier, 1829)*	Goatee Croaker	MFB	NE	CDA/048/2001	Rs, BC
Genus *Johnius* Bloch 1793					
Johnius amblycephalus (Bleeker, 1855)	Bearded Croaker	MBF	NE		Mg
Johnius belangerii (Cuvier, 1830)*	Belanger's Croaker	MB	NE	CDA/121/2002	Mg
Johnius carutta Bloch, 1793**	Karut Croaker	BM	NE	CDA/219/2008	Mg
Johnius coitor (Hamilton, 1822)	Coitor Croaker	BM	LC[Δ]		Mg
Johnius dussumieri (Cuvier, 1830)	Sin Croaker	MB	NE		Mg
Johnius macropterus (Bleeker, 1853)*	Largefin Croaker	M	NE	CDA/220/2008	Mg
Genus *Nibea* Jordan, Thompson 1911					
Nibea maculata (Bloch, Schneider, 1801)**	Blotched Croaker	M	NE	CDA/221/2008	Mg
Genus *Otolithes* Oken 1817					
Otolithes ruber (Bloch, Schneider, 1801)**	Tigertooth Croaker	MB	NE	CDA/222/2008	Mg
Genus *Otolithoides* Fowler 1933					
Otolithoides biauritus (Cantor, 1849)	Bronze Croaker	M	VU[M,B]		Mg,Ci
Otolithoides pama (Hamilton, 1822)*	Pama Croaker	BM	NE	CDA/223/2008	Mg,Ci
Genus *Paranibea* Trewavas 1977					
Paranibea semiluctuosa (Cuvier, 1830)*	Half-mourning Croaker	M	NE	CDA/122/2002	Mg
Genus *Protonibea* Trewavas 1971					
Protonibea diacanthus (Lacepede, 1802)*	Blackspotted Croaker	MB	VU[M,B]	CDA/123/2002	Mg,Ci
Family Polynemidae (Threadfin fishes)					
Genus *Eleutheronema* Bleeker 1862					
Eleutheronema tetradactylum (Shaw, 1804)*	Fourfinger Threadfin	MBF	NE	CDA/049/2001	Mg,Ci, Hvt,BC
Genus *Leptomelanosoma* Motomura, Iwatsuki 2001					
Leptomelanosoma indicum (Shaw, 1804)*	Indian Threadfin	MB	VU[M,B]	CDA/187/2006	Mg,Ci
Genus *Polydactylus* Lacepède 1803					
Polydactylus plebeius (Broussonet, 1782)**	Striped Threadfin	MB	NE	CDA/152/2003	Mg,Ci
Polydactylus sextarius (Bloch, Schneider, 1801)*	Blackspot Threadfin	MB	NE	CDA/124/2002	Mg
Family Mullidae (Goatfishes)					
Genus *Upeneus* Cuvier 1829					
Upeneus sulphureus Cuvier, 1829**	Sulphur Goatfish	MB	NE	CDA/224/2008	Mg,Or
Family Drepaneidae (Sicklefishes)					
Genus *Drepane* Cuvier 1831					
Drepane punctata (Linnaeus, 1758)*	Spotted Sicklefish	M	NE	CDA/125/2002	Mg,Ci, Or
Family Monodactylidae (Moonies)					
Genus *Monodactylus* Lacepède 1801					
Monodactylus argenteus (Linnaeus, 1758)*	Silver Moony	MB	NE	CDA/248/2012	Mg,Or
Monodactylus kottelati Pethiyagoda, 1991**	Silver Moony	MB	NE	ZSI/MARC/F-2517/2014	Mg,Or
Family Nandidae (Leaf fishes)					
Genus *Nandus* Valenciennes 1831					
Nandus nandus (Hamilton, 1822)*	Gangetic Leaffish	FB	LC[Δ]	CDA/050/2001	Mg,Ci,Or
Family Terapontidae (Terapon perches)					
Genus *Pelates* Cuvier 1829					
Pelates quadrilineatus (Bloch, 1790)	Fourlined Terapon	BM	NE		Mg,Or
Genus *Terapon* Cuvier 1816					
Terapon jarbua (Forsskål, 1775)*	Jarbua Terapon	BM	LC[Δ]	CDA/037/2001	Mg,Or
Terapon puta Cuvier, 1829*	Small-scaled Terapon	BM	NE	CDA/108/2002	Rs,Or,BC
Terapon theraps Cuvier, 1829*	Largescaled Terapon	BM	LC[Δ]	CDA/214/2008	Mg,Or
Family Cichlidae (Cichlids)					
Genus *Etroplus* Cuvier 1830					
Etroplus suratensis (Bloch, 1790)*	Pearlspot	BF	LC[Δ]	CDA/056/2001	Rs,Ci,Or, Hvt,BC
Genus *Oreochromis* Günther 1889					
Oreochromis mossambicus (Peters, 1852)**	Mozambique Tilapia	FB	NT[Δ]	CDA/057/2001	Rs, Or, BC

Continued

Table 1. *Continued.*

Taxon	Common Name	Habitat	Conservation Status	Voucher	Faunal characteristics
Family Uranoscopidae (Stargazers)					
Genus *Ichthyoscopus* Swainson 1839					
Ichthyscopus lebeck (Bloch, Schneider, 1801)*	Longnosed Stargazer	M	NE	CDA/128/2002	Mg, NFF
Family Blenniidae (Blennies, allies)					
Genus *Omobranchus* Valenciennes 1836					
Omobranchus zebra (Bleeker, 1868)*	Zebra Blenny	MB	NE	CDA/253/2013	Mg, BC, NFF
Family Eleotridae (Gudgeons)					
Genus *Butis* Bleeker 1856					
Butis butis (Hamilton, 1822)	Duckbill Sleeper	BM	LC$^{\Delta}$		Mg,Or
Genus *Eleotris* Bloch, Schneider 1801					
Eleotris fusca (Forster, 1801)	Dusky Sleeper	BF	LC$^{\Delta}$		Mg,Or
Eleotris melanosoma Bleeker, 1853**	Broadhead Sleeper	BF	LC$^{\Delta}$	CDA/154/2003	Rs, BC
Family Gobiidae (Gobies)					
Genus *Acentrogobius* Bleeker 1874					
Acentrogobius cyanomos (Bleeker, 1849)*		BM	NE	CDA/058/2001	Rs,BC, NFF
Acentrogobius griseus (Day, 1876)	Grey Goby	BF	NE		Or, Mg, end, NFF
Acentrogobius masoni (Day, 1873)	Mason's Goby	BF	NE		Mg, NFF
Acentrogobius viridipunctatus (Valenciennes, 1837)	Spotted Green Goby	BF	NE		Or, Mg, NFF
Acentrogobius madraspatensis (Day, 1868)	Manyband Goby	BM	NE		Mg, NFF
Genus *Bathygobius* Bleeker 1878					
Bathygobius fuscus (Ruppell, 1830)	Dusky Frillgoby	BM	LC$^{\Delta}$		Mg,Or, NFF
Bathygobius ostreicola (Chaudhuri, 1916)		B	DD$^{\Delta}$		Mg, end, NFF
Genus *Brachygobius* Bleeker 1874					
Brachygobius nunus (Hamilton, 1822)	Bumblebee Goby	BF	NE		Rs, NFF
Genus *Drombus* Jordan, Seale 1905					
Drombus globiceps (Hora, 1923)*	Kranji Drombus	BF	LC$^{\Delta}$	CDA/129/2002	Mg, NFF
Genus *Glossogobius* Gill 1859					
Glossogobius giuris (Hamilton, 1822)*	Tank Goby	FB	LC$^{\Delta}$	CDA/173/2004	Mg,Or, BC
Genus *Gobiopterus* Bleeker 1874					
Gobiopterus chuno (Hamilton, 1822)	Transparent Goby	BF	DD$^{\Delta}$		Rs,Or, BC, NFF
Genus *Oligolepis* Bleeker 1874					
Oligolepis acutipennis (Valenciennes, 1837)	Sharptail Goby	MB	DD$^{\Delta}$		Mg,Or, NFF
Oligolepis cylindriceps (Hora, 1923)*		B	NE	CDA/249/2012	Rs, BC, NFF
Genus *Oxyurichthys* Bleeker 1857					
Oxyurichthys microlepis (Bleeker, 1849)*	Maned Goby	MB	NE	CDA/196/2007	Mg,Or, NFF
Oxyurichthys tentacularis (Valenciennes, 1837)*	Tentaccled Goby	MB	NE	CDA/130/2002	Mg,Or, NFF
Genus *Parapocryptes* Bleeker 1857					
Parapocryptes rictuosus (Valenciennes, 1837)		MB	NE		Mg, NFF
Genus *Periophthalmus* Bloch, Schneider 1801					
Periophthalmus kalolo Lesson, 1831*	Common Mudskipper	BM	NE	CDA/197/2007	Mg,Or
Genus *Psammogobius* Smith 1935					
Psammogobius biocellatus (Valenciennes, 1837)*	Sleepy Goby	MB	LC$^{\Delta}$	CDA/131/2002	Rs, BC, NFF
Genus *Pseudapocryptes* Bleeker 1874					
Pseudapocryptes elongatus (Cuvier, 1816)		BF	LC$^{\Delta}$		Mg
Genus *Pseudogobiopsis* Koumans 1935					
Pseudogobiopsis oligactis (Bleeker, 1875)		B	LC$^{\Delta}$		Mg, NFF
Genus *Pseudogobius* Popta 1922					
Pseudogobius javanicus (Bleeker, 1856)	Javaness Goby	BF	NE		Mg,Or, NFF
Genus *Stigmatogobius* Bleeker 1874					
Stigmatogobius minima (Hora, 1923)	Minima Goby	B	NE		Rs,Or,BC, NFF
Genus *Taenioides* Lacepède 1800					
Taenioides buchanani (Day, 1873)	Burmese Gobyeel	BF	NE		Mg, NFF
Genus *Trypauchen* Valenciennes 1837					
Trypauchen vagina (Bloch, Schneider, 1801)*	Burrowing Goby	MB	NE	CDA/155/2003	Mg, NFF
Genus *Yongeichthys* Whitley 1932					
Yongeichthys nebulosus (Forsskal, 1775)**	Shadow Goby	MB	NE	CDA/132/2002	Mg, NFF
Family Ephippidae (Spadefishes)					
Genus *Ephippus* Cuvier 1816					
Ephippus orbis (Bloch, 1787)**	Orbfish	M	NE	CDA/225/2008	Mg
Genus *Platax* Cuvier 1816					
Platax orbicularis (Forsskal, 1775)**	Orbicular Batfish	MB	NE	CDA/250/2012	Mg,Or
Family Scatophagidae (Scats)					
Genus *Scatophagus* Cuvier 1831					
Scatophagus argus (Linnaeus, 1766)*	Spotted Scat	BF	LC$^{\Delta}$	CDA/059/2001	Mg,Or
Family Siganidae (Spinsfoots, Rabbitfishes)					
Genus *Siganus* Forsskål 1775					
Siganus canaliculatus (Park, 1797)**	White-spotted Spinefoot	MB	NE	CDA/226/2008	Mg,Or
Siganus javus (Linnaeus, 1766)*	Streaked Spinefoot	MB	NE	CDA/133/2002	Mg,Or
Siganus vermiculatus (Valenciennes, 1835)*	Vermiculated Spinefoot	MB	LC$^{\Delta}$	CDA/227/2008	Mg,Or
Family Acanthuridae (Surgeon fishes)					
Genus *Acanthurus* Forsskål 1775					
Acanthurus mata (Cuvier, 1829)**	Elongate Surgeonfish	M	LC$^{\Delta}$	CDA/198/2007	Mg,Or
Acanthurus triostegus (Linnaeus, 1758)**	Convict Surgeonfish	M	LC$^{\Delta}$	MARC/ZSI/F2516/2013	Mg, Or
Family Sphyraenidae (Barracudas)					
Genus *Sphyraena* Artedi 1793					
Sphyraena jello Cuvier, 1829**	Pickhandle Barracuda	M	NE	CDA/156/2003	Mg,Ci

Continued

Table 1. *Continued.*

Taxon	Common Name	Habitat	Conservation Status	Voucher	Faunal characteristics
Sphyraena putnamae Jordan, Seale, 1905**	Sawtooth Barracuda	M	NE	CDA/157/2003	Mg,Ci
Family Trichiuridae (Hairtail fishes)					
Genus *Eupleurogrammus* Gill 1862					
Eupleurogrammus glossodon (Bleeker, 1860)**	Longtooth Hairtail	M	NE	CDA/158/2003	Mg,Ci
Genus *Lepturacanthus* Fowler 1905					
Lepturacanthus savala (Cuvier, 1829)**	Savalai Hairtail	MB	NE	CDA/160/2003	Mg,Ci
Genus *Trichiurus* Linnaeus 1758					
Trichiurus lepturus Linnaeus, 1758**	Largehead Hairtail	MB	NE	CDA/159/2003	Mg,Ci
Family Scombridae (Mackerels, Seerfishes, Tunas, Albacores)					
Genus *Euthynnus* Lütken 1883					
Euthynnus affinis (Cantor, 1849)**	Kawakawa	M	LC$^{\Delta}$	CDA/134/2002	Mg,Ci
Genus *Rastrelliger* Jordan, Starks 1908					
Rastrelliger kanagurta (Cuvier, 1816)**	Indian Mackerel	M	DD$^{\Delta}$	CDA/060/2001	Mg,Ci
Genus *Scomberomorus* Lacepède 1801					
Scomberomorus lineolatus (Cuvier, 1829)*	Streaked Seerfish	M	LC$^{\Delta}$	CDA/135/2002	Mg,Ci
Family Anabantidae (Climbing perches)					
Genus *Anabas* Cloquet 1816					
Anabas cobojius (Hamilton, 1822)*	Gangetic Koi	F	DD$^{\Delta}$	CDA/061/2001	Mg,Ci,Or
Anabas testudineus (Bloch, 1792)*	Climbing Perch	FB	DD$^{\Delta}$	CDA/062/2001	Mg,Ci,Or
Family Osphronemidae (Gouramies)					
Genus *Trichogaster* Bloch, Schneider 1801					
Trichogaster fasciata Bloch, Schneider, 1801*	Banded Gourami	FB	LC$^{\Delta}$	CDA/063/2001	Mg,Or
Trichogaster lalius (Hamilton, 1822)*	Dwarf Gourami	F	LC$^{\Delta}$	CDA/064/2001	Mg,Or
Family Channidae (Snakeheads, Murrels)					
Genus *Channa* Scopoli 1777					
Channa gachua (Hamilton, 1822)**	Pigmy Snakehead	F	LC$^{\Delta}$	CDA/241/2010	Mg, Or, BC
Channa marulius (Hamilton, 1822)**	Great Snakehead	F	LC$^{\Delta}$	CDA/234/2009	Mg,Ci,Or
Channa punctata (Bloch, 1793)*	Spotted Snakehead	F	LC$^{\Delta}$	CDA/065/2001	Ci, Rs, Or, BC
Channa striata (Bloch, 1793)*	Striped Snakehead	FB	LC$^{\Delta}$	CDA/066/2001	Ci,Rs,Or, Hvt,BC
Order Pleuronectiformes					
Family Paralichthyidae (Lefteye flounders)					
Genus *Pseudorhombus* Bleeker 1862					
Pseudorhombus arsius (Hamilton, 1822)*	Largetooth Flounder	MB	NE	CDA/136/2002	Mg,Ci
Pseudorhombus microgna thus Norman, 1927**	Flat Fish	M	NE	CDA/137/2002	Mg
Pseudorhombus triocellatus (Bloch, Schneider, 1801)**	Three-spotted Flounder	M	NE	CDA/138/2002	Mg,Ci,Or
Family Soleidae (Soles)					
Genus *Brachirus* Swainson 1839					
Brachirus orientalis (Bloch, Schneider, 1801)*	Oriental Sole	MBF	NE	CDA/199/2007	Mg,Ci
Genus *Solea* Quensel 1806					
Solea ovata Richardson, 1846*	Ovate Sole	M	NE	CDA/182/2005	Mg
Family Cynoglossidae (Tongue soles)					
Genus *Cynoglossus* Hamilton 1822					
Cynoglossus lida (Bleeker, 1851)**	Roughscale Tonguesole	M	NE	CDA/228/2008	Mg
Cynoglossus lingua Hamilton, 1822*	Long Tongue Sole	MB	NE	CDA/200/2007	Mg
Cynoglossus puncticeps (Richardson, 1846)*	Speckled Tonguesole	MB	NE	CDA/189/2006	Mg
Order Tetraodontiformes					
Family Triacanthidae (Tripod fishes)					
Genus *Triacanthus* Oken 1817					
Triacanthus biaculeatus (Bloch, 1786)*	Short-nosed Tripodfish	BM	NE	CDA/067/2001	Rs, BC
Family Balistidae (Triggerfishes)					
Genus *Abalistes* Jordan, Seale 1906					
Abalistes stellaris (Bloch, Schneider, 1801)**	Starry Triggerfish	M	NE	CDA/247/2011	Mg,Or
Family Tetraodontidae (Puffers)					
Genus *Arothron* Müller 1841					
Arothron reticularis (Bloch, Schneider, 1801)	Reticulated Pufferfish	MB	NE		Mg,Or, NFF
Arothron stellatus (Anonymous, 1798)	Stellate Puffer	MB	NE		Mg,Or, NFF
Genus *Chelonodontops* Smith, 1958					
Chelonodontops patoca (Hamilton, 1822)*	Milkspotted Puffer	MB	NE	CDA/190/2006	Mg, NFF
Genus *Dichotomyctere* Dumèril, 1855					
Dichotomyctere fluviatilis (Hamilton, 1822)*	Green Pufferfish	FB	NE	CDA/193/2006	Rs,Or, NFF
Genus *Gastrophysus* Muller, 1843					
Gastrophysus oblongus (Bloch, 1786)*	Lattice Blaasop	MB	NE	CDA/191/2006	Mg, NFF
Genus *Lagocephalus* Swainson 1839					
Lagocephalus lunaris (Bloch, Schneider, 1801)	Lunartail Puffer	MB	NE		Mg,Or, NFF
Genus *Leiodon* Swainson, 1839					
Leiodon cutcutia (Hamilton, 1822)*	Ocellated Pufferfish	BF	LC$^{\Delta}$	CDA/192/2006	Mg,Or, NFF
Family Diodontidae (Porcupinefishes)					
Genus *Diodon* Linnaeus 1758					
Diodon hystrix Linnaeus, 1758**	Spot-fin Porcupinefish	M	NE	CDA/251/2012	Mg,Or, NFF

**New records during post-restoration period; *Post-restoration inventory; Δ IUCN Red List Status; CAMP Report 1998; P Pooniah (1993); NBFGR National Bureau of Fish Genetic Resources (2010); CE/CR-Critically Endangered; VU-Vulnerable; NT-Near Threatened; LC-List Concern; DD-Data Deficient; M Menon (2004); B Barman et al. (2007) NE-Not Evaluated; EN/E- Endangered; MBF- Marine, Brackish water, Freshwater; BM- Brackish water, Marine ; MB- Marine, Brackish ; M- Marine ; F- Fresh water ; FB- Fresh water, Brackish water; B- Brackish water; CAMP-Conservation Assessment and Management Plan Workshops (1998), Mg-Migratory, Ci-Commercially important, Or-Ornamental fish, Hvc-High value commercial fish, Rs-Resident species, end-Endemic, Hvt-High value target species BC- Breeding in Chilika, NFF- Not Food Fish.

retrieval. The higher ichthyofaunal inventory made during the post-restoration period may be attributed to a number of interventions, including the opening of a new artificial lake mouth nearer to the main water body of the lake (11 km from Magarmukh), desiltation of 14 km long Palur canal restoring the connectivity with the sea through the mouth of Rusikulya River, dredging of a 27 km long new channel connecting Magarmukh and the river confluence point in the northern sector, and desiltation of the lead channel between Magarmukh and the lake mouth (Figure 3). The hydrological intervention in 2000 increased the tidal flux by 44% and salinity level in the lake by 35% as compared to the pre-restoration period (Table 3). Because salinity dynamics are the main driving force enhancing fisheries in general and fish diversity in particular, the enhancement of ichthyofaunal diversity recorded during post-restoration period was likely mainly attributable to it. In general, opening of the new lake mouth in the year 2000 showed positive impact on the lake fisheries due to improvement in overall water quality (Mohanty et al. 2009). Recruitment success, effective seaward migration of catadromous fishes and restoration of degraded habitats being facilitated by hydrological intervention also likely helped enhance ichthyofaunal diversity. The entire scenario changed during the eco-restoration period with positive effects. The freshwater fish fauna of the Mahanadi River system was reflected in the freshwater fish fauna of Chilika Lake as the tributaries of Mahanadi River drain into it.

The families and species numbers in each order is depicted in (Figure 4), indicating that Perciformes is numerically the largest with 150 (47.32%) species followed by Clupeiformes with 36 (11.36%) species, Cypriniformes with 25 (7.89%) species and Siluriformes with 23 (7.25%) species. Pristiformes, Rajiformes, Gonorynchiformes, Orectolobiformes, and Cyprinodontiformes were represented by single species only (Figure 4).

In total, 15 families (Balistidae, Diodontidae, Acanthuridae, Ephippidae, Mullidae, Nemipteridae, Lactariidae, Tetrarogidae, Synbranchidae, Atherinidae,

Table 2. Number of families, genera and species, and total for each taxonomic category.

Order	Family	Genus	Species
Orectolobiformes	1	1	1
Carcharhiniformes	2	5	7
Pristiformes	1	1	1
Rajiformes	1	1	1
Myliobatiformes	2	4	8
Osteoglossiformes	1	2	2
Elopiformes	2	2	2
Anguilliformes	4	6	9
Clupeiformes	5	18	36
Gonorynchiformes	1	1	1
Cypriniformes	2	17	25
Siluriformes	9	16	22
Aulopiformes	1	2	2
Mugiliformes	1	5	11
Atheriniformes	1	1	2
Cyprinodontiformes	1	1	1
Beloniformes	3	5	6
Syngnathiformes	1	3	3
Synbranchiformes	2	3	4
Scorpaeniformes	3	5	5
Perciformes	37	95	150
Pleuronectiformes	3	4	8
Tetraodontiformes	4	9	10
23	**88**	**207**	**317**

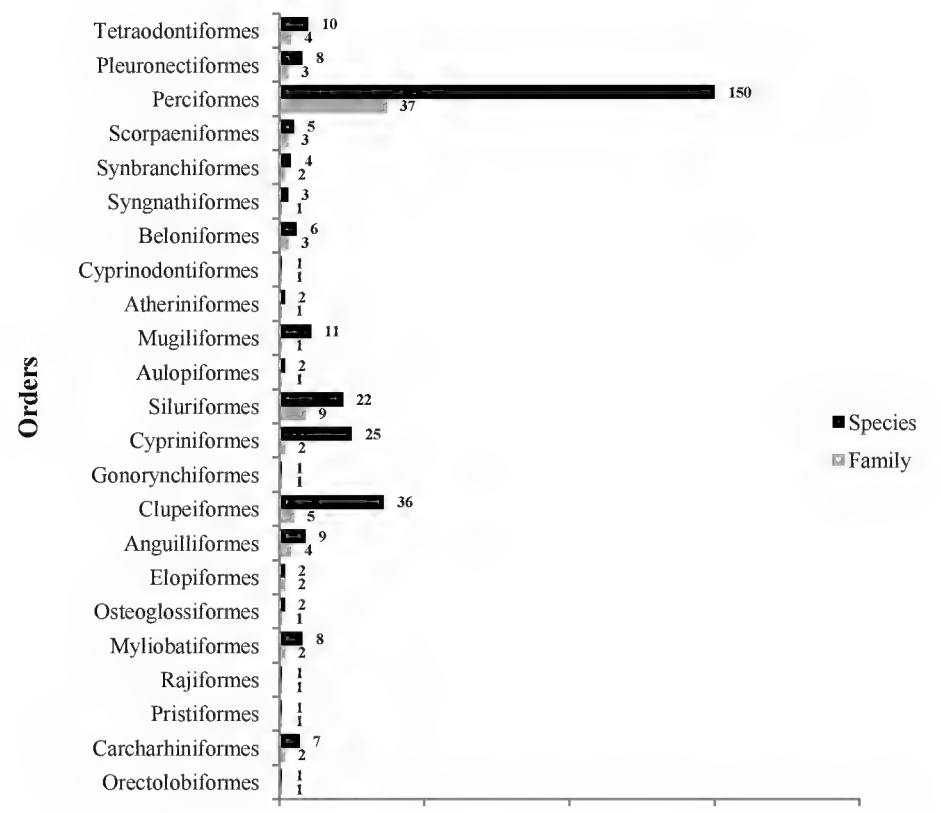

Figure 4. Orders, families and species numbers for ichthyofaunal components of Chilika Lake.

Table 3. Variation in average water quality parameters in Chilika Lake during pre and post restoration periods.

Water quality parameter	Pre-restoration (1999–2000)	Post-restoration (pooled average for 13 years) 2001–02 to 2013–14	Percentage variation
Water Temparature (°C)	28.1	28.56	+ 1.64
Mean depth (cm)	180	149.35	- 17.03
Transparency (cm)	77	64.76	- 15.89
pH	8.4	8.3	- 1.19
Total Alkalinity (ppm)	94	106.83	+ 13.65
Salinity (PSU)	8.5	11.47	+ 34.94
Dissolved Oxygen (ppm)	7	7.15	+ 2.14
BOD (ppm)	NR	2.73	0.0
Nitrate (ppm)	0.260	1.12	+ 330.77
Otho Phosphate (ppm)	0.230	0.28	+ 21.74

NR - Not Record

Dussumieridae, Synodontidae, Hemiscylliidae, Sphyrnidae and Rhinobatidae) and five orders (Tetradontiformes, Atheriniformes, Aulopiformes, Orectolobiformes and Rajiformes) were documented for the first time in Chilika Lake during the post-restoration survey. No representatives of two families, namely Chirocentridae and Cobitidae, were found during the survey after opening of the new mouth. Sixty-five species of fish, mostly Gobiidae, were not re-collected during the post-restoration period. Two elasmobranchs (*Glyphis gangeticus* and *Pristis pectinata*) have never been recollected since they were first reported. *Pristis pectinata*, once a widely distributed sawfish, has been eliminated from large areas of its former range, and therefore its absence from Chilika Lake indicates its likely elimination from the lake ecosystem. However, the sawfish recorded as *Pristis pectinata* from Chilika Lake may be refered as *Pristis clavata* as observed by Faria et al. (2013). The Ganges Shark (*Glyphis gangeticus*) was once recorded from Chilika Lake (Chaudhuri 1916b) but the species has never been sighted or reported thereafter. Most literature records and specimens identified as this species are actually Bull Sharks *Carcharhinus leucas* or other carcharhinids. However, after an extensive search over 10 years, a few specimens of this species were sighted in 1996 in the lower reaches of the Ganges River in West Bengal, India (Compagno 2002, 2007). There is no verified marine record of the *G. gangeticus* to date. Therefore the only report from Chilika was perhaps due to misidentification and confusion with *C. leucas*, which definitely occur in the lake.

Migratory and resident species

Out of the total 317 species, 271 (85.49%) and 46 (14.51%) were categorized as migratory and resident species respectively. Therefore the lake fishery is strongly migratory species-dependent. The migratory species are either seasonal migrants or incidental visitors to the lake from both the sea and inflowing rivers. The higher number of migratory species is perhaps due to ecorestoration measures implemented after 2000, particularly the opening of the new lake mouth and resultant improvement in water quality (Table 3). Because migratory species form the major component of the lake fishery, sustainability of ecorestoration measures, particularly the optimal functioning of the lake mouth and Palur canal to enhance recruitment and breeding migrations assume greater significance. Migratory species included 14 catadromous species (*Anguilla bengalensis, Anguilla bicolor bicolor, Chanos chanos, Liza macrolepis, Liza melinopterus, Liza parsia, Liza planiceps, Liza subviridis, Ellochelon vaigiensis, Lates calcarifer, Moolgarda cunnesius, Moolgarda seheli, Moolgarda speigleri* and *Mugil cephalus*) and 13 anadromous species (*Anodontostoma chacunda, Brachirus orientalis, Hilsa kelee, Ilisha megaloptera, Pastinachus sephen, Pisodonophis boro, Pisodonophis cancrivorus, Rhinomugil corsula, Stolephorus commersonnii, Tenualosa ilisha and Tenualosa toli*).

Categorization of marine, estuarine/brackish and freshwater species

Chilika Lake being an assemblage of marine, brackish and freshwater ecosystems, harbors fish species belonging to these three regimes thereby enhancing ichthyofaunal diversity and contributing to the commercial landings. A modified form of the widely accepted categorization by Elliot et al. (2007) is adapted here to categorize the fishes of Chilika Lake into marine, brackish and freshwater species. All marine species are considered as marine migrants and many of the freshwater species are riverine migrants. Our study of ichthyofaunal diversity in Chilika Lake indicates that marine, brackish and freshwater species constitute 35.65%, 43.85% and 20.50% respectively (Figure 5).

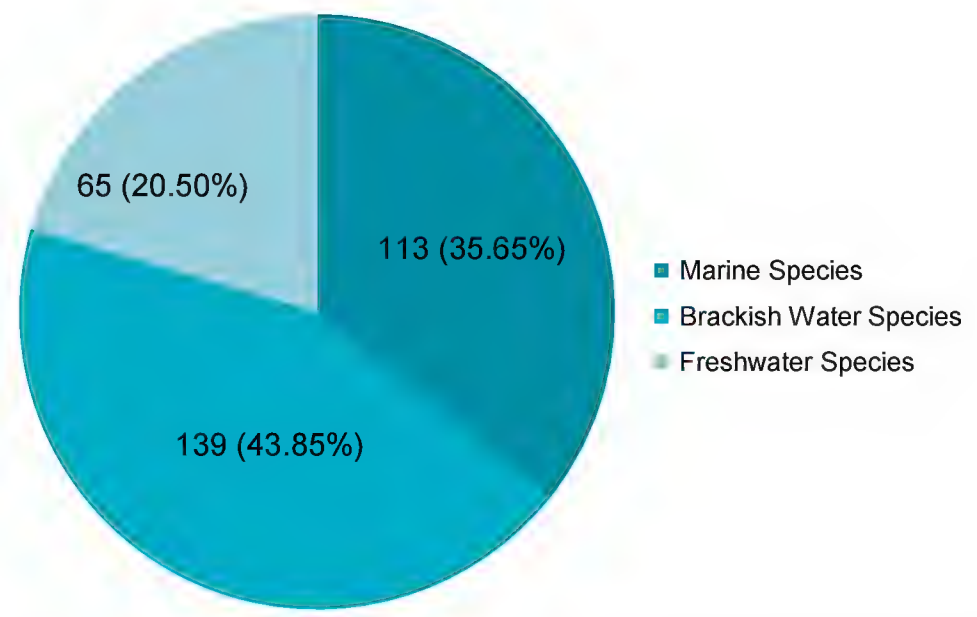

Figure 5. Ichthyofaunal composition of marine, brackish and freshwater species of Chilika Lake.

Faunal characteristics

Faunal characteristics are presented in Table 1. The fish fauna of Chilika Lake includes two endemic gobiid species (*Acentrogobius griseus* and *Bathygobius ostreicola*) and one exotic cichlid species (*Oreochromis mossambicus*), which entered the lake during 1998 from aquaculture units on island villages. In total, there are 13 high value target species (*Mystus gulio, Strongylura strongylura, Channa striata, Etroplus suratensis, Tenualosa ilisha, Hyporhamphus limbatus, Lates calcarifer, Liza macrolepis, Moolgarda cunnesius, Mugil cephalus, Eleutheronema tetradactylum, Daysciaena albida* and *Sillago sihama*) out of a total of 129 commercially important species, these are in large demand in the market and command higher unit prices. The current ichthyofaunal analysis further documented for the first time 114 species belonging to 48 families with ornamental value for home and public aquarium use, a resource with considerable economic potential. Documentation of native

ornamental fish germplasm resources from Chilika Lake calls for conservation and wise use that could potentially augment livelihoods of local communities through small-scale ornamental fish trade and captive breeding practices. Further research is warranted to develop technologies for artificial propagation (captive breeding) and rearing of important native ornamental fishes from Chilika Lake. The faunal characteristics also indicated that 56 species are breeding in the lake and five species (*Daysciaena albida, Eleutheronema tetradactylum, Gerres setifer, Leiognathus equulus and Nematalosa nasus*) have two populations, one in the lake and the other in coastal waters. Similarly *Rhinomugil corsula,* the only freshwater mullet in the region, also has two populations one in the lake and the other in the rivers. Out of 317 fish species known so far from Chilika Lake, 278 are known to be food fishes (129 are commercially important – the others are eaten but neither commercially harvested nor have consumers demand).

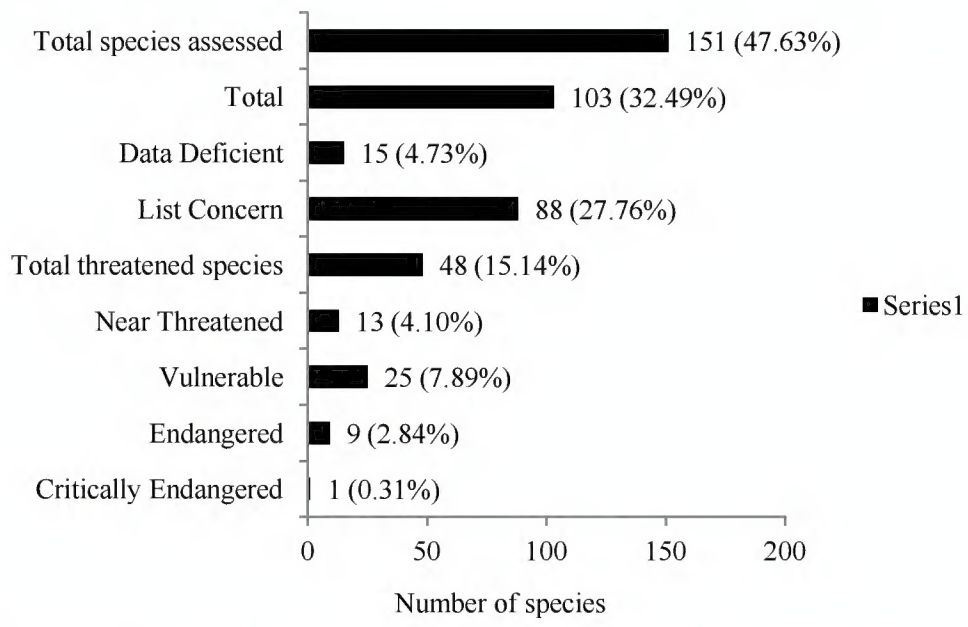

Figure 6. Number of species assessed for different categories of biodiversity status.

Biodiversity status and threatened species

An assessment of biodiversity status for the listed species and assessment of threatened fishes from the total of 317 fish species known from the lake was attempted for the first time in the present study. Review of literature on the biodiversity status of fishes and threatened fishes of India based on IUCN criteria (Ponniah 1993; Molur and Walker 1998; Menon 2004; Barman et al. 2007; Lakra et al. 2010; IUCN 2014; Froese and Pauly 2015) documented a total list of 151 species from Chilika Lake which were assessed for biodiversity status. In total, 35 species in 25 families were recorded as threatened and categorized under Critically Endangered (CR), Endangered (EN), Vulnerable (VU) (Table 4; Figure 6). Further, 13 more species in eight families are categorized as Near Threatened (NT) that need conservation measures unless they may slip to threatened category very soon. Only 88 species (27.76%) were assessed as List Concern (LC), whereas 15 species (4.73%) were categorized as Data Deficient (DD). Most importantly, 166 species (52.36%) of fishes of Chilika Lake were Not Evaluated (NE) for their conservation status. In other words, status of 52.36% of fishes is unknown, and need to be evaluated at least at the national level.

The most of the common threats to the biodiversity of fishes of India stems from various anthropogenic and natural stressors (Das et al. 2004; Kurup and Radhakrishnan 2006; Rout et al. 2007), as has been observed for fishes in Chilika Lake. There, the most relevant threats were degradation of aquatic environment, siltation and encroachment of spawning grounds in the lake by *Ghery* operation, other destructive fishing practices, unabated expansion of illegal large pen culture units (*Gheries*),

Table 4. Assessment of biodiversity status of Chilika fishes (Categorization of threatened and non-threatened species with conservation status).

	Conservation status (Number of species by family)								
Family	**CR**	**EN**	**VU**	**NT**	**Total threatened species**	**LC**	**DD**	**Total**	**Total species assessed**
Acanthuridae (surgeon fishes)						2		2	2
Adrianichthydae (rice fish)						1		1	1
Ambassidae (perchlets, glass fishes)						4		4	4
Anabantidae (climbing perches)							2	2	2
Anguillidae (freshwater eels)				2	2				2
Aplocheilidae (asian revulines)						1		1	1
Ariidae (sea catfish)						1		1	1
Bagridae (bagrid catfishes)			1		1	3		3	4
Belonidae (needle fishes)						1		1	1
Carangidae (jacks, trevallies, pompanos, scads)						1		1	1
Carcharhinidae (requiem sharks)	1			4	5				5
Channidae (snakeheads, murrels)						4		4	4
Cichlidae (cichlids)				1	1	1		1	2
Clariidae (air-breathing catfish)		1			1				1
Clupeidae (herrings, allies)			2		2	4		4	6
Cobitidae (loaches)						1		1	1
Cyprinidae (carps, minnows)			3		3	20	1	21	24
Dasyatidae (stingrays)			1	1	2		3	3	5

Continued

Table 4. *Continued.*

Datnioididae (freshwater triple tails)					1		1	1
Eleotridae (gudgeons)					3		3	3
Elopidae (tenpounders)					1		1	1
Engraulidae (anchovies)					2	1	3	3
Gerreidae (silver biddies)					2		2	2
Gobiidae (gobies)					6	3	9	9
Haemulidae (grunts, rubberlips)		1		1	1		1	2
Hemiramphidae (halfbeaks)					1		1	1
Hemiscyllidae (bamboo sharks)			1	1				1
Heteropneustidae (airsac catfish)		1		1				1
Latidae (lates perches/asian seabass)		1		1				1
Leiognathidae (pony fishes, silverbellies)					3		3	3
Mastacembelidae (spiny eels)					3		3	3
Megalopidae (tarpons)						1	1	1
Mugilidae (mullets)		1		1	4	1	5	6
Muraenesocidae (pike congers)		2		2				2
Myliobatidae (eaglerays)	1	1		2				2
Nandidae (leaf fishes)					1		1	1
Notopteridae (featherbacks)	1			1	1		1	2
Ophichthidae (snake eels)					2		2	2
Osphronemidae (gouramies)					2		2	2
Pangasiidae (shark catfish)		1		1				1
Platycephalidae (flatheads)						1	1	1
Polynemidae (threadfin fishes)		1		1				1
Pristidae (saw fish)	1			1				1
Pristigasteridae (pellonas)	1			1				1
Rhinobatidae (guitar fishes)		1		1				1
Scatophagidae (scats)					1		1	1
Schilbeidae (schilbid catfishes)	1	2		3				3
Sciaenidae (croakers)		2		2	1		1	3
Scombridae (mackerels, seerfishes, tunas, albacores)					2	1	3	3
Serranidae (groupers, rock-cods)		1	2	3		1	1	4
Siganidae (spinsfoots, rabbitfishes)					1		1	1
Siluridae (eurasian catfishes)	1	1	1	3				3
Sisoridae (sisorid catfish)	1	1		2				2
Sphyrnidae (hammerheaded shark)	1		1	2				2
Synbranchidae (swamp eels)					1		1	1
Syngnathidae (pipe fishes, sea horses)		1		1	1		1	2
Terapontidae (terapon perches)					2		2	2
Tetraodontidae (puffers)					1		1	1
Tetrarogidae (waspfishes)					1		1	1
Total	**1**	**9**	**25**	**13**	**48**	**88**	**15**	**103**	**151**
% to the total assessment of species	**0.66**	**5.96**	**16.56**	**8.61**	**23.18**	**58.28**	**9.93**	**76.82**	**100.00**

CR-Critically Endangered; EN- Endangered; VU-Vulnerable; NT-Near Threatened; LC-List Concern; DD-Data Deficient

drastic decline in salinity dynamics, and siltation at the river mouth and Magarmukh (the gateway between the inlet channel and the lake proper). Mohanty et al. (2007) reported that six economic species (*Tenualosa ilisha, Rhinomugil corsula, Acanthopagrus berda, Chanos chanos, Megalops cyprinoides and Elops machnata*) almost disappeared from commercial landings during the eco-degradation phase but gradually reappeared during the ecorestoration phase.

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